Imperial Bureau of Plant Breeding and Genetics

Plant Breeding Abstracts

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Note.—Initialled abstracts are written by the following:—

Mr J. C. Cullen	J. C. C.
Mr J. L. Fyfe	J. L. F.
Dr H. W. Howard	H.W. H.
Dr H. M. Leake	H. M. L.
Dr K. Mather	K. M.
Dr B. P. Pal	B. P. P.
Mr J. Wilson	J. Wilson
Dr J. Wishart	J. W.

* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. IX, No. 4.

Part 1. Empire Section

STATISTICS 519

1253. BISHOP, D. J. and NAIR, U. S. 519.24

A note on certain methods of testing for the homogeneity of a set of estimated variances.

Suppl. J. R. Statist. Soc. 1939 : **6** : 89–99.

The use now being made in analysis of variance and other problems of tests for homogeneity of a set of estimated variances lends interest to this examination of the relation between three forms of the test (*a*) Neyman and Pearson's likelihood ratio criterion, (*b*) Welch's criterion with adjustable weights and (*c*) Bartlett's criterion. With equal numbers of degrees of freedom (*a*) and (*c*) are equivalent; when the degrees of freedom are unequal and not too small, Bartlett's approximation is considered excellent. For single degrees of freedom a new table for testing homogeneity is provided. J. W.

1254. FISHER, R. A. 519.24

The comparison of samples with possibly unequal variances.

Ann. Eugen., Camb. 1939 : **9** : 174–80.

The author describes the method of Behrens for testing the hypothesis of equality of the means of two populations whose variances are possibly unequal, and shows how the calculations should be carried out in practice, with the aid of tables. J. W.

1255. NAIR, K. R. 519.24

Some balanced confounded arrangements for the 5^n type of experiment.

Proc. 26th Indian Sci. Congr., Lahore 1939 : Pt III : p. 200. (Abst.).

The author has previously discussed a method of getting confounded arrangements for the general symmetrical type of experiment, i.e. of n at p levels each, and has demonstrated the method for the 3^n and 4^n types. In the present paper similar arrangements are obtained for the 5^n type of experiment. J. W.

1256. JEFFREYS, H. 519.24:631.421

Random and systematic arrangements.

Biometrika 1939 : **31** : 1–8.

An interesting article which brings out, among other things, the way in which the random and systematic elements are balanced in the modern lay-outs adopted for field experiments. J. W.

1257. KISHEN, K. 519.24:631.421

On a general method of constructing the appropriate compounds in terms of the twelve 3 x 3 Latin Squares for any of the eight components $N_1K_1P_1$, $N_1K_1P_2$, $N_1K_2P_1$, etc., of the second order interaction in a 3 x 3 x 3 factorial arrangement.

Proc. 26th Indian Sci. Congr., Lahore 1939 : Pt. III : p. 199. (Abst.).

The author gives a general method of constructing appropriate combinations, with suitable positive and negative signs, of the yields given by a 3 x 3 x 3 factorial arrangement for the 12 possible 3 x 3 Latin squares so as to obtain any of the eight components of the second-order interactions. J. W.

1258. NEWMAN, D. 519.24:631.421
The distribution of range in samples from a normal population, expressed in terms of an independent estimate of standard deviation.
Biometrika 1939 : **31** : 20–30.
An approximate method is described for finding the 5 per cent and 1 per cent points of the distribution of the ratio of the range in a sample (difference between highest and lowest values), divided by the square root of an independent and unbiassed estimate of the variance of the observations in the sample. The resulting tables are useful for enabling a rapid assessment to be made in field experiments of differences between treatment means which have contributed to the significant result obtained by the method of analysis of variance. J. W.

1259. YATES, F. 519.24:631.421
The recovery of inter-block information in variety trials arranged in three-dimensional lattices.
Ann. Eugen., Camb. 1939 : **9** : 136–56.
A defect in the quasi-factorial and incomplete block designs of field experiments, as originally put forward, was that they were less efficient than ordinary randomized blocks if little reduction in variability was obtained through using smaller blocks. This was because certain of the treatment comparisons were confounded with block differences, and the information contained in the inter-block comparisons was discarded.
For the case of the three-dimensional lattice a method is described of estimating the relative accuracy of these comparisons, and of recovering the information contained in them. The complete arrangement of the computations is given, together with a fully-worked numerical example.
With this modification the efficiency of the design is shown to be always greater than that of randomized blocks, except where there is no reduction of variance due to the use of smaller blocks. It is shown that it is legitimate to analyse the results of a quasi-factorial experiment as if it were one in ordinary randomized blocks. J. W.

1260. YATES, F. and
HALE, R. W. 519.24:631.421
The analysis of Latin squares when two or more rows, columns, or treatments are missing.
Suppl. J. R. Statist. Soc. 1939 : **6** : 67–79.
An example of a 7 x 7 Latin square in which no figures were available for two of the treatments is made the occasion for demonstrating how to complete the analysis of a Latin square with two or more missing treatments, rows or columns. The Youden Square, constructed by imposing additional restrictions on a balanced incomplete block design, is shown to be in effect a Latin square with several missing rows. This square is examined, and shown to be a valid experimental arrangement. J. W.

1261. DAWSON, C. D. R. 519.24:631.421:633.15
An example of the quasi-factorial design applied to a corn breeding experiment.
Ann. Eugen., Camb. 1939 : **9** : 157–73.
In producing new varieties of maize it is found that a considerable amount of trial is required before inbred lines are found which give the best results on crossing. A relatively large number of different parents and first generation hybrids have to be grown at one time for comparison. To do this the author adopted the quasi-factorial design of Yates, and in this paper he presents the full analysis of the data from an experiment consisting of 27 varieties in three complete replications. The factors considered were (*a*) number of days from sowing to silking, (*b*) total weight of plant at harvest, (*c*) number of ears and (*d*) yield of grain. Under the conditions of the experiment, in which blocks did not eliminate any of the soil heterogeneity, the use of the quasi-factorial method was not considered justifiable. J. W.

1262. Chan-Choong, P. A. 519.24:631.421:633.18
Testing large numbers of rice varieties by the quasi-factorial method.
Agric. J. Brit. Guiana 1939 : **10** : 78–88.
Yates' quasi-factorial method of arranging variety trials is outlined and an example given of its application to a rice variety trial involving 169 varieties. It is concluded that although the use of the method entails extra expense and labour as compared with the single progeny row method previously used, it proves cheaper in the long run since the most promising varieties may be selected more quickly and the number of varieties promoted to replicated variety trials may be reduced to a minimum.

1263. Nair, K. R.,
Chakravarti, S. C. and
Mahalanobis, P. C. 519.24:631.421:633.18
A 10 x 10 quasi-factorial experiment at Chinsurah with 100 strains of rice.
Proc. 26th Indian Sci. Congr., Lahore 1939 : Pt III : p. 199. (Abst.).
The paper describes the analysis of grain and straw yields of rice, of which 100 strains were laid out in an experiment of 10 x 10 quasi-factorial design. J. W.

1264. Christidis, B. G. 519.24:631.421:633.51
Further studies on competition in yield-trials with cotton.
Emp. J. Exp. Agric. 1939 : **7** : 111–20.
A method is worked out for detecting the effect of competition in cotton by measuring in a number of varietal experiments the difference between the yield of the middle row and the average yield of the three rows in the plot. Statistical tests show that competition is undoubtedly a disturbing factor in yield trials; its effect is often significant, but the causes appear to be so complex, and to vary so much with external conditions, that it appears useless to classify cotton varieties according to their competitive value. The variability of one or two-row plots is such that they are not recommended for yield trials. J. W.

1265. Kalamkar, R. J. and
Dhannalal. 519.271.3:631.421:633.51
Variability of plant density and the estimation of yield of cotton by sampling.
Proc. 26th Indian Sci. Congr., Lahore 1939 : Pt III : p. 198. (Abst.).
Five varieties of cotton, replicated four times, were grown experimentally to investigate variability of plant density, and to study sampling technique. The number of plants surviving differed for different varieties, and when adjusted for plant number one variety was shown to be definitely inferior in yield to the others. Comparison of estimated and actual yields showed that it was possible to use sampling technique with accuracy for estimating the yield of cotton. J. W.

1266. Subbaiya, M. 519.271.3:631.421:633.61
Sampling in sugar cane experimental work.
Proc. 26th Indian Sci. Congr., Lahore 1939 : Pt III : p.197–98. (Abst.).
The extent of sampling necessary in sugar cane was tested experimentally by means of a 5 x 5 Latin square, the object being to find the size of sample required to give a significance of 0·5 per cent or less of sucrose. A table detailing the findings is presented, and it is shown that the size of the sample should be adjusted to the different levels of maturity of the crop to get a constant degree of accuracy. J. W.

BREEDING 575

1267. Bell, G. D. H. 575:633
Crops and plant breeding.
J. R. Agric. Soc. 1939 : **100** : 5–36.
In this review, among other subjects, recent work on breeding wheat, barley, oats, potatoes, sugar beet and hops is dealt with.

1268. ENGLEDOW, F. L. 575:633

The place of plant physiology and of plant-breeding in the advancement of British agriculture.

Emp. J. Exp. Agric. 1939 : **7** : 145–49.

The objectives and limitations of breeding self and cross-fertilized plants are indicated and the need for more fundamental research along various lines is stressed. These include developmental physiological studies, work on the nature of hybrid vigour, the definition of the meaning of quality, the development of tests for quality and yield applicable in the early stages of breeding, the collection of crop plants throughout their range, the search for useful mutant types in the collections, and the determination of the degree of uniformity which it is desirable to seek. It is pointed out that long-term breeding policies should be planned according to the relative importance of the crops and their amenability to improvement. Such policies are difficult to plan owing to the likelihood in many cases of a change in economic demands during the considerable number of years needed to produce a new type.

1269. ROBINSON, D. H. 575:633(41+42)

Plant breeding remains an art.

Fmr's Wkly, Lond. 1939 : **10**(26) : p. 47.

A brief resumé of the more important plant breeding work done in Britain during the last century.

1270. 575:633(54)

A review of the plant breeding in India with suggestions for the future.

Proceedings of the Second Meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India, held at Lahore from the 6th to 9th December, 1937 with appendices, Delhi 1939 : 59–70, 240–51.

The following three papers were discussed at the meeting and mention was made of other work which has been significant in the history of plant breeding in India and Burma.

Pal, B. P. (*pp. 240–44*).

The history of the breeding of wheat, rice, cotton, sugar cane and linseed in India is discussed and the present position is also reviewed. Further advances are likely to be made by the use of X-rays to induce mutations, by distant hybridization coupled with induced polyploidy, by breeding for disease resistance, and other methods.

In order to avoid unnecessary duplication of work it is suggested that the more fundamental research and breeding work on crops such as wheat, varieties of which show a wide adaptability, should be centred at two or three main stations.

Thadani, K. I. (*pp. 245–46*).

The history and present position of plant breeding work in Sind are reviewed. Work on Sind desi cotton, on American types such as Sind Sudhar, and on wheat has been of greatest importance. The breeding methods used and the method of maintaining pure stocks of seed are described.

Ramiah, K. (*pp. 247–51*).

Some of the more fundamental problems facing the breeder are reviewed. Among the tasks noted as particularly needing attention are the following : the carrying out of extensive tests of new strains throughout the region where the crop is grown; examination of the question of genetic deterioration in varieties of self-fertilized crops; development of refined techniques for selection within established lines; collection of a wide range of material for use in breeding; studies of botanical crop composition and trials of mixtures of selected types.

1271. PANSE, V. G. 575:633(54)
Some aspects of plant breeding in India.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt III : Sect. Agric. : Abst. 8 : p. 211.
It is pointed out that there is great scope for crop improvement in India. Breeding policy, and the handling and testing of material available for breeding are touched upon. B. P. P.

1272. ÅKERMAN, Å. 575:633.1
Cereal plant breeding. The pioneers and the systems and principles.
Corn Tr. News (Golden Jubilee, 1888–1938) 1938 : 82–93.
A comprehensive review is given of the development of plant breeding from the earliest times, including a useful account of the work of the Swedish plant breeders and the varieties they have produced, an outline of the achievements in breeding for disease resistance and of the main results attained in the individual cereals. Reference is finally made to the many breeding problems that still remain to be solved.

GENETICS 575.1

1273. ALAM, N. 575.11–18
An important genetic constant.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt III : Sect. Agric. : Abst. 9 : p. 212.
This paper is similar to the one abstracted in "Plant Breeding Abstracts", Vol. IX, Abst. 10.

1274. DARLINGTON, C. D. 575.116.12
The biology of crossing-over.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt. III : Sect. Bot. : Abst. 18 : p. 141.
The mechanism of crossing-over in relation to meiosis is discussed. Crossing-over, besides being an indispensable condition of meiosis, produces certain incidental effects which are of evolutionary significance. It simply recombines the parts of the chromosomes or genes without changing their arrangements or produces secondary structural alterations in already changed chromosomes of structural and numerical hybrids.
The author considers it probable that secondary structural change is an integral part of the mechanism of variation in all sexually reproducing organisms. B. P. P.

1275. MEHTA, B. K. 575.125:633
The role of heterosis in plant breeding and agriculture.
Poona Agric. Coll. Mag. 1939 : **30** : 159–72.
The various hypotheses that have been advanced to explain the phenomenon of heterosis and the significance of heterosis in the breeding of several crop plants are discussed.
It is suggested, in order to avoid the necessity of using fresh single- or double-cross seed each year in such crops as maize, that the cross between F_1 plants and local, heterozygous strains should be utilized. It is claimed that such hybrid seed could be grown on from year to year without losing vigour.

1276. SOLOMON, S. 575.125:633
Hybrid vigour in plants and its significance in plant breeding and agriculture.
Agric. Live-Stk India 1939 : **9** : 139–48.
An account is given of the various theories which have been advanced to explain the phenomenon of heterosis, and the importance of heterosis to the plant breeder is indicated with special reference to the work of American breeders on maize.

1277. 575.3:631.525

Varietal adaptability.

Rhod. Agric. J. 1939 : **36** : 340–41.

A brief note explaining the genetic basis of varietal acclimatization in non-technical language.

ORIGIN OF SPECIES, ETC. 576.1

1278. SAHNI, B. 576.12:575.24:581.056

Revolutions in the plant world. Presidential address delivered at the annual meeting of the Academy held on Saturday, March 5, 1938.

Nat. Acad. Sci. India (1937) : 46–60.

Attention is called to the very marked discontinuities in the lines of descent in the plant and animal kingdoms which are observable at certain times in geological history, e.g. the sudden emergence of the *Glossopteris* flora in the southern hemisphere. The various theories which have been advanced to explain such sudden changes are discussed. The author goes on to review recent cytogenetical work on the experimental induction of chromosome aberrations, particularly by extremes of temperature. He suggests that sudden changes in climate might have produced such aberrations on a large scale in nature, and may have led to a period of mass mutation during which a whole flora was transformed in the course of a (geologically speaking) very short time.

The importance of a careful study of the beds laid down during the course of such "revolutions" in the plant world is urged.

1279. MULLER, H. J. 576.12:575.246

Reversibility in evolution considered from the standpoint of genetics.

Biol. Rev. 1939 : **14** : 261–80.

The author discusses first of all the reversibility of single gene changes, taking his evidence from work on *Drosophila*, and then deals with more complex evolutionary changes. In the former case, true reversals can apparently occur but in the latter so many separate gene changes and interactions are involved that although a very similar end result may be obtained phenotypically, the genetic constitution of the race will remain very different.

1280. WINGE, Ø. 576.16:575.11

The genetic aspect of the species problem.

Proc. Linn. Soc. Lond. 1937–38 : **150** : 231–38.

Cases in which the genetic differences between pairs of Linnean species are so small that the geneticist would not regard the species as distinct and other cases in which a single Linnean species contains several distinct genetical groups, often inter-sterile, are cited. The evidence indicating that specific differences are determined in the nucleus and not in the cytoplasm is summarized. Three mechanisms that may determine specific distinctions are discussed, viz. polymeric factors, lethal genes and extreme stability of genes of taxonomic importance.

CYTOLOGY 576.3

1281. GATES, R. R. 576.312.34

The structure of the chromosome.

Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt IV : Sect. Bot. : Abst. 22 : 2–3.

The substance of this paper is the same as that summarized in Vol. IX, Abst. 16.

1282. MAUDE, P. F. 576.312.35

The Merton catalogue. A list of the chromosome numerals of species of British flowering plants.

New Phytol. 1939 : **38** : 1–31.

Chromosome counts of 1302 species are listed, and the references to original authors given.

AGRICULTURE 63

1283. 63(91 + 92.1 + 92.2 + 54.8)
STOCKDALE, F. A. 575:633
Report by Sir Frank Stockdale, K.C.M.G., C.B.E. Agricultural Adviser to the Secretary of State for the Colonies on a visit to Malaya, Java, Sumatra and Ceylon, 1938.
Colon. Adv. Coun. Agric. Anim. Health 1939 : C.A.C. 454 : Pp. 108.
This report includes an account of the plant breeding work which is being conducted in the countries visited, most of which has been reviewed from time to time in "Plant Breeding Abstracts". In some cases the author suggests ways in which the organization of this breeding work could be improved.

PLANT DISEASES 632

1284. PAL, B. P. and
MUNDKUR, B. B. 632.451:633.1–1.521.6(54.5)
Studies in Indian cereal smuts. I. Cereal smuts and their control by the development of resistant varieities.
Proc. Indian Acad. Sci. 1939 : **9** : Sect. B: 267–70.
Investigations have been started in the Imperial Agricultural Research Institute at Delhi to test the relative resistance of strains of wheat, oats and barley to their respective smuts, with the ultimate aim of breeding resistant varieties.

1285. 632.484:633–1.521.6:575(54)
BURNS, W. 633.11–2.452–1.521.6:575(54)
Breeding for disease-resistance in agricultural plants.
Sci. & Cult. : **2** : 619–21.
A brief, non-technical discussion is given of the work that has been done in India on breeding wilt-resistant varieties of cotton, sunn hemp and flax. The physiological nature of wilt resistance is indicated and the recommendations of the first Conference of Scientific Research Workers on Cotton in India on the subject of breeding for wilt resistance are quoted (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 603).
The work that is being done on breeding wheat for resistance to rust is also mentioned.

WHEAT 633.11

1286. 633.11:575(93.1)
Fifth Annual Report for the year 1938.
Wheat Research Institute, Christchurch, New Zealand. C. Wheat-breeding. Bull. Dep. Sci. Industr. Res. N.Z. 1939 : No. 68 : 15–21.
Two lines of the cross Tuscan x White Fife have been tested further and both outyielded Tuscan. They are somewhat more resistant to lodging than Tuscan, one of them, 31,05, maturing about two days later.
The Argentine wheat Lin Calel has been under test. It yields about the same as Tuscan, and has very high baking quality, but it has a marked tendency to lodge. The variety has been used as a parent in crosses for the first time, as also have the varieties Cross 7 and Dreadnought.
Ten hybrid lines of Cross 60 [(Tuscan x Marquis) x Tuscan] that were tested are not likely to be retained, since they show no superiority to Cross 7. Further trials are, however, being made.
Three lines from Cross 64 [(Reward x Tuscan) x Tuscan] approach Tuscan in yield and have very high baking quality.
Reselections from the variety Hunters II include one line that significantly outyielded Hunters II, was slightly more resistant to lodging and had similar baking quality, in a trial at Morven. Comparisons of this line and Hunters II with Hunters I show that bushel weight is the only character in which Hunters I is superior.
Cross 7 has given good results as a spring wheat, maturing considerably earlier than Tuscan.
The Australian variety, Bencubbin, has also been under trial as a spring wheat.

Reports are given of analytical yield trials on important varieties and selections.
The aim in further wheat breeding at the Institute is to combine increased yield, good straw and the highest quality.

1287. Pal, B. P. and
Alam, N. 633.11:575.125:581.02 .
The effect of certain external factors upon the manifestation of hybrid vigour in wheat.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt III : Sect. Agric. : Abst. 11 : p. 212.
Hybrid vigour was studied in a cross between Pusa 52 and Pusa 165 wheats under different conditions as regards dates, times and depths of sowing, and as regards spacing.
The results indicated that the expression of heterosis was greatly influenced by the several factors studied. B. P. P.

1288. Frankel, O. H. 633.11:575.42"793"(93.1)
Tainui, a new spring wheat variety.
N.Z.J.Sci. Tech. 1939 : **20** : 319A–23A.
The variety Tainui was selected from a mixed sample of wheat obtained from Portugal. It has outyielded the standard variety Tuscan in both autumn and spring sowings, but is prone to lodging when sown in the autumn. Its high yield is due to its large grain size.
In baking quality, Tainui is superior to Tuscan but slightly inferior to Cross 7. It is recommended as a spring wheat for Canterbury and for certain parts of North Island, New Zealand.

1289. 633.11:576.16:581.9
Ellerton, S. 633.11:575.242:575.127.2:576.356.2
The origin and geographical distribution of *Triticum sphaerococcum* Perc. and its cytogenetical behaviour in crosses with *T. vulgare* Vill.
J. Genet. 1939 : **38** : 307–24.
The hexaploid wheat *Triticum sphaerococcum* is confined to Northern India and the Central Provinces and thus differs from the two hexaploid species *T. vulgare* and *T. compactum* which are found in their greatest diversity in Afghanistan. *T. sphaerococcum* differs from the other hexaploid wheats in its short stature, its small ears and its characteristic, small, round grains and practically hemispherical, inflated glumes. In crosses with *T. vulgare* all these characters behave as one recessive gene. No splitting up of the group of *sphaerococcum* characters due to crossing-over was found and it is suggested that the *sphaerococcum* factor may be a small deficiency. The F_1 hybrid between *T. sphaerococcum* and *T. vulgare* forms 21 bivalents in many cells but formation of one quadrivalent is common. An exceptionally high proportion of heterozygous speltoid mutants was found in several F_2 progenies from the F_1 hybrid and it is suggested that this fact can be explained if the chromosomes which carry the speltoid character are involved in a reciprocal translocation which leads to quadrivalent formation in the F_1. H. W. H.

OATS 633.13

1290. Jones, E. T. 633.13:575(42.9)
New varieties of oats produced at the Welsh plant breeding station.
J. Agric. Soc., Univ. Coll. Wales 1938 : **27** : 28–30.
The oat varieties bred at the Station are described. Among the newer varieties are Ceirch Llwyd Cwta S.171, S.175 and S.84, which have already been referred to in "Plant Breeding Abstracts", Vol. VIII, Absts 677 and 693. A further new variety now being developed for marketing is the Aberystwyth White Winter Oat S.147. This equals S.81 and S.82 in winter-hardiness and possesses very high quality grain. It gives a higher yield than S.81 and S.82 and is intended to replace the latter as a variety for cultivation on good soils.

1291. Toulson, G. A. 633.13:575"793"(41+42)
Winter oat varieties.
Seale-Hayne Annu. 1938–39 : **1** : 17–24.
Recent winter oat breeding work in Great Britain is reviewed with particular reference to the new varieties, S.81 and Resistance, produced at the Aberystwyth and Cambridge plant breeding stations respectively. In a variety trial both of these varieties out-yielded the control, Grey Winter, and also gave grain of higher market value.

1292. Jenkin, T. J. 633.13:575.127.2(42.9)
The work of the Welsh plant breeding station.
Trans. R. Welsh Agric. Soc. 1938 : 123–25.
This report deals, *inter alia*, with the oat breeding work of the Station. Several new strains of Ceirch Llwyd Cwta (a practically awnless *Avena strigosa* type produced by crossing with *A. brevis*) are being tested and two of these in 1938 appeared to be superior in grain yield and earliness of ripening to Ceirch Llwyd Cwta S.171. A large number of other spring and winter oat selections are under test.

BARLEY 633.16

1293. 633.16:575:581.6(42)
Hunter, H. 633.16:519.241.1:581.192:581.48:631.557
Various aspects of malting barley breeding.
J. Inst. Brew. 1939 : **45** : 286–98.
High yield in the barley varieties Spratt Archer and Spratt was found to be associated with high tiller survival and with low total nitrogen in the grain. It is concluded that further efforts to increase the yield in this type of barley by breeding will automatically tend to give types with a lower total nitrogen content than the present forms.
The breeding of high-yielding, high-nitrogen barleys for feeding purposes would appear to be difficult. It is suggested that short, stiff-strawed varieties of the type developed at Cambridge from crosses of Archer-Goldthorpe and Spratt may be of use in this respect, since they are high-yielding and sufficiently strong-strawed to enable an application of a nitrogenous fertilizer to be made at a late stage in the development of the plant. Such late applications of nitrogen are shown by the author to increase the nitrogen content of the grain.
The improvement already effected in British malting barleys by the introduction of Spratt Archer and Plumage Archer has chiefly been in the straw characters and in an increase in tiller survival, the latter factor being responsible for improved yield and malting quality.
The paper was followed by a discussion that is printed in full.

1294. Sallans, H. R. and
Anderson, J. A. 633.16:581.6(71.3)
Observations on the study of varietal differences in the malting quality of barley. Part IV.
Canad. J. Res. 1939 : **17** : Sect. C : 57–71.
Malting tests were conducted on samples of barley varieties grown at widely separated stations. It is concluded that if routine malting tests show that the mean values for any variety, when grown at twelve stations representing a reasonable range of environment, differ from the values for the standard variety by more than 1 per cent in extract yield or 10 per cent in diastatic activity or content of wort nitrogen, a real difference which cannot be overcome by any reasonable change in malting conditions exists between the varieties.

MILLETS AND SORGHUMS 633.17

1295. Rangaswami Ayyangar, G. N. and
Venkatarama Reddy, T. 633.174:575.11:581.466
The inheritance of basal feathered stigmas (and basal barbed subules) in sorghum.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt IV : Sect. Agric. : Abst. 17 : p. 214.
The gene which is responsible for the stigmas being fully feathered behaves as a simple recessive. The symbol St_{Bf} is allotted. B. P. P.

1296. Rangaswami Ayyangar, G. N. and
Kunhi Koran Nambiar, A. 633.174:575.11.061.5:581.466
Genic differences governing the distribution of stigmatic feathers in sorghum.
Curr. Sci. 1939 : **8** : 214–16.

Three races of *Sorghum coriaceum* and one of *S. conspicuum* were found in which the stigmatic hairs were much less numerous and slightly longer than in the normal type. This "sparse feathered" type was found to be a simple Mendelian recessive to the normal, "bushy" type, the corresponding genes being designated *sb* and *SB*.
The sparse "feathering" of the stigmas determined by the gene *sb* was correlated with a similar sparseness of the barbs of the awns.

1297. Rangaswami Ayyangar, G. N.,
Panduranga Rao, V., and
Kunhi Koran Nambiar, A. 633.174:575.11.061.6:581.48
The occurrence and inheritance of purple blotched grains in sorghum.
Curr. Sci. 1939 : **8** : 213–14.

A condition in sorghum in which the grains are irregularly blotched with purple is described. The condition is found in African species, chiefly *S. caffrorum*, *S. caudatum* and *S. nigricans* and it is determined by a single dominant gene which is designated *PB*, the corresponding recessive type, "not blotched", being *pb*.

1298. Rangaswami Ayyangar, G. N.,
Sankara Ayyar, M. A. and
Kunhikoran Nambiar, A. 633.174:575.246:575.247:575.11.061.6
Recurrent pseudo-mutations in sorghum.
Curr. Sci. 1939 : **8** : 171–72.

Somatic mutations to the white pericarp condition were observed in two hybrid families of sorghum that were heterozygous for brown pericarp. Similar somatic mutations were observed in some of the heterozygous brown pericarp plants in the progeny. The mutations did not affect the embryo, so that the mutant white grains behaved similarly to the normal heterozygous grains in progeny tests; hence the author calls them "pseudo-mutations".
Similar recurrent "pseudo-mutations" were observed in other lines heterozygous for brown nucellus.
There is some evidence that these mutations were reversible.

1299. Janaki Ammal, E. K. 633.174:576.312.35
Supernumerary chromosomes in para-sorghum.
Curr. Sci. 1939 : **8** : 210–11.

A number of plants of *Sorghum purpureo-sericeum* Schwenf. and Ashers were examined cytologically, and their chromosome number was found to vary from $2n = 10$ to $2n = 14$. The extra chromosomes of plants having more than ten chromosomes appeared to be identical with the smallest or fifth chromosome of the normal haploid set, both in size and in position of the centromere. At meiosis the supernumerary chromosomes often paired among themselves or with the normal fifth chromosomes, giving bivalents, trivalents or quadrivalents. Plants carrying the extra chromosomes do not differ phenotypically from those in which they are absent and it is concluded that they are genetically inert.
The author considers it possible that the basic number of chromosomes in the Andropogonae may have been seven and not five and that *S. purpureo-sericeum* represents a stage in the reduction of the original number to five.
Chromosome numbers of $n = 5$ are reported in *S. versicolor* Anderss and *S. dimidiatum* Stapf.

RICE 633.18

1300. Mitra, S. K. and
Ganguli, P. M. 633.18:575.11–181:581.48
Inheritance of size and shape of grains in rice.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt. III : Sect. Agric. : Abst. 13 : p. 213.

Segregation in the ratio of 3 short to 1 long was observed in F_2 in respect of length of spikelets. With regard to breadth of spikelets the distributions of the F_2 and F_3 frequencies indicated that multiple factors were concerned. B. P. P.

1301. Ramiah, K. and
Ramaswamy, K. 633.18:575.125
Hybrid vigour in rice.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt. III : Sect. Agric. : Abst. 10 : p. 212.

Heterosis, when present, generally manifested itself by greater tillering, a larger number of ears per plant, longer panicles, earliness in flowering, and a larger yield.
The relation between hybrid vigour and embryo size was studied and it was concluded that heterosis is not directly related to enlarged size. B. P. P.

1302. Ramiah, K. and
Parthasarathy, N. 633.18:575.243:537.531
X-ray mutations in rice.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt. III : Sect. Agric. : Abst. 12 : 212–13.

A large number of mutations obtained by X-raying rice seed are described. Some of these are forms of chlorophyll deficiency while others represent different kinds of spikelet sterility, grain size and shape, leaf size and type of panicle.
Some of the types isolated are promising economically. B. P. P.

1303. Srinivasa Ayyangar, C. R. and 633.18:575.252:575
Ramanujam, S. 633.18:576.356.5
Induction of somatic mutations as a method of crop improvement in rice.
Proc. Ass. Econ. Biol. Coimbatore 1937 : **5** : 46–51.

Several bud mutations were observed when normal rice varieties and abnormal forms of genetical interest were propagated vegetatively. These changes included somatic doubling of the chromosomes (diploid from haploid and tetraploid from diploid), the occurrence of single extra chromosomes in haploids, of dwarf mutants and of one type (a gene mutation) that promises to be of considerable economic importance, viz. a form of Sirumani rice which matures 15–20 days earlier than the normal type.

1304. Wickramasekera, G. V. 633.18:581.48
A multiple seeded variety of rice (*Oryza sativa* L.).
Trop. Agriculturist 1939 : **92** : 279–80.

The rice variety, T.E.B.1, obtained from Travancore was observed to have grains which contained 1–3 separate seeds. The spikelets showed a corresponding number of ovaries and pairs of stigmas contained in a single floret.

LEGUMINOUS FORAGE PLANTS 633.3

1305. Williams, R. D. 633.322:575.11.061.6
Genetics of cyanogenesis in white clover (*Trifolium repens*).
J. Genet. 1939 : **38** : 357–65.

The author has found that cyanogenetic plants occur in widely varying proportions in different types of English wild white clover, hardly at all in cultivated or "Dutch" white clover and

in the wild form endemic to central and eastern Europe, while certain large leaved wild forms in the west of France consist almost exclusively of strongly cyanogenetic plants.
Using the picrate paper method with a standardized technique the inheritance of cyanogenesis was studied and was shown to be due to a single dominant factor *Ac*, forms not producing HCN being *ac ac*. Different families and in some cases different plants in the same family differ in their content of hydrocyanic acid and this is attributed to the action of modifying factors. J. L. F.

ROOTS AND TUBERS 633.4

1306. 633.491:575(41)
633.491:575.127.2(41)

The Scottish plant breeding station. Craigs House, Corstorphine, Edinburgh.

Trans. Highl. Agric. Soc. Scot. 1939 : **51** : Ser. 5 : 181–83.

The potato breeding work in progress at the Station is described. Interspecific crosses involving cultivated varieties and *Solanum demissum, S. andigenum* and *S. Rybinii* are being made. *S. demissum* is notable on account of its immunity to blight caused by *Phytophthora infestans*, though it is a very poor cropper. Crossing and repeated back-crossing to *S. tuberosum* with constant selection for high resistance to blight has resulted in the production of excellent, high-yielding, resistant varieties which are now under test. Susceptible seedlings are eliminated by artificial mass infection with blight spores in the greenhouse.
S. andigenum is the most prolific tuber-bearing species other than *S. tuberosum*, and heavy yielding hybrids have been obtained from these two species.
S. Rybinii, a diploid species, is claimed to possess some resistance to virus diseases. Although it is a poor cropper, its hybrids are very vigorous and one (Kerr's Pink x *S. Rybinii*) has given the highest single plant yield so far obtained at the station.
In breeding cultivated varieties attention is being paid to resistance or tolerance to virus diseases. With regard to the leaf roll and Y viruses, tolerant varieties are being sought, but in the case of the A and X viruses field immunity is attainable.
A new variety, Craigs Defiance, was released by the Station in 1939. Bred from the cross Epicure x Pepo, it is an early maincrop variety with high yield. It is field immune to the X and A viruses, immune to wart disease and not seriously affected by blight.

FIBRES 633.5

1307. 633.51:575(41)

Progress reports from experiment stations, season 1937–1938.

Emp. Cott. Gr. Corp. Lond. 1939 : Pp. 150.

The Report contains the following sections of interest to plant breeders:—

Wells, W. G. — *Queensland. Cotton Research Station, Biloela. Progress Report for the season 1937–38.* (*pp. 1–10*).

Owing to the increasing importance of jassid attacks, a programme of hybridization aimed at evolving a jassid resistant variety has been started. Crosses have been made between U.4 and the popular American Upland variety, Miller. The selection work with the latter variety has been continued.

South Africa. Cotton Experiment Station, Barberton. Progress Report for the season 1937–38.

MacDonald, D. and Fielding, W. L. — *Cotton-breeding and field experiments.* (*pp. 11–12*).

Rose, M. F. — *Rotation crops.* (*pp. 23–27*).

The selection work with U.4 has mainly consisted in the study of reselections from early maturing, well fruiting and high ginning families able to withstand poor conditions. A reselection 6128 has proved very drought resistant and little affected by *Alternaria*. Some (U.4 x Cambodia) x U.4 strains have shown resistance to *Alternaria* and more crosses of this kind are to be made in the hope of getting strains with better lint quality.

It has been found that emasculation in the afternoon prior to opening of the flower and immediate pollination is the hybridization technique which gives the best results.
Three back-crosses of *G. trilobum* and Sea Island received from Trinidad and reported to be resistant to bollworm were not very successful.
Jassid trials showed the resistance of surviving (U.4 x Cambodia) x U.4 strains to be similar to that of the best U.4 selections.
The results of variety trials are given.
It has been found that a sample of 5 seeds per plot with 10 replications gives accurate estimation of a difference of 1·03 mm. in lint length.
Inbred lines of maize resistant to streak disease have been isolated from Peruvian and Hickory and some F_1 crosses between them have proved highly resistant.

Bowmaker, P. A. — *South Africa. Cotton Experiment Station, Magut, Natal. Progress Report for the season 1937–1938. (pp. 53–59).*

The results of variety trials involving chiefly U.4 selections are given.
Selection work with maize was continued, resistance to drought being an important character.

Lochrie, J. V. — *Swaziland. Cotton Experiment Stations, Bremersdorp and Croydon. Progress Report for the season 1937–38. (pp. 60–65).*

Selection work with cotton has been confined, as in previous years, to material from crosses made by Harland, mostly (U.4 x Cambodia) x U.4 strains. U.4 selections from Barberton were tested in variety trials.
Among the rotation crops, selection work with maize, kaffir corn and groundnuts was pursued.

Peat, J. E. and Prentice, A. N. — *Southern Rhodesia. Cotton Station, Gatooma. Progress Report for the season 1937–38. (pp. 66–74).*

In a good year for testing strains, the best U.4 64 derivatives have been outstanding. From the segregating U.4 64 material it is hoped to obtain a strain with the qualities, good cropping, good opening and hardiness and with better jassid resistance, higher ginning percentage and better lint.
(U.4 x Cambodia) x U.4 strains were not as good as U.4/64 segregates while Harland's Barberton strains have been rather disappointing.

King, H. E., Knight, R. L. and Anson, R. R. — *Anglo-Egyptian Sudan. Progress Report on the work on cotton carried out by the Plant Breeding Section, Agricultural Research Institute, season 1937–38. (pp. 79–85).*

Further progress was made in the isolation of improved subtypes of the more successful strains of Egyptian cotton, in particular of X1530, X1730, N.T. 2 and N.T. 36. The transference of resistance to blackarm to X1530 and N.T. 2 by back-crossing was carried a stage further and yield trials of new sub-strains and variety trials were conducted in the Gezira, an outstanding feature of the latter being the success of N.T. 36.
Selection and varietal testing were continued with American cotton. The results of grading and spinning tests are briefly reported and the results of varietal trials are given in appendices.

Nye, G. W.
Hosking, H. R. and Jameson, J. D.

Uganda. Cotton Experiment Stations, Bukalasa and Serere. Progress Reports for the season 1937–38.
Bukalasa zone (pp. 86–88).
Serere zone. (pp. 89–95).

At Bukalasa a large number of field selections were received but most of them had unsatisfactory staple in the first progeny. Selection and hybridization work was continued, important aims being resistance to blackarm and to wilt. The results of variety trials are briefly

reported and also the release to native cultivation of the strain B.P. 52. Spinning tests have shown that this variety gives a Highest Standard Count of 69 as against 46 for Buganda Local.

Buganda Local appears to be the most wilt resistant strain. No evidence has been obtained that more resistant populations are obtained by planting seed from plants which have escaped attack in wilt infected areas.

At Serere selection and hybridization work was continued with special attention to resistance to jassid and to blackarm. The results of variety trials are given. S.P. 84, a selection from U. 4/4/2 and S.P. 102, a natural hybrid, did extremely well. Spinning tests are also reported.

King, J. G. M. — *Tanganyika. Lubaga Experimental Station, Shinyanga, Progress Report, 1937–38.* (*pp. 102–05*).

Selection with cotton and groundnuts is briefly reported.

Fuggles-Couchman, N. R. — *Tanganyika. Morogoro Experimental Station and Kingolwira Extension Farm. Progress Report for the season 1937–38.* (*pp. 106–13*).

Variety trials at Morogoro with sorghum, sweet potato and groundnuts are reported.

Cassava varieties are tested for resistance to mosaic and seedlings are raised and selected for resistance.

Cotton selection work with U.4, Uganda introductions, Trinidad hybrids and local cotton is in progress at Kingolwira.

Nyasaland. Cotton Experiment Station, Domira Bay, Progress Report for the season 1937–38. (*pp. 118–23*).

In cotton variety trials the highest yield was given by H.K., a cross of Harland's between U.4 and Cambodia back-crossed to U.4.

Voelcker, O. J. — *Nigeria. Progress Report on cotton selection work in the Southern Provinces, season 1937–38.* (*pp. 133–35*).

The breeding work with cotton in the Southern Provinces of Nigeria continued to be directed towards the maintenance of purity in Ishan A and also the improvement of the smoothness of lint in Ishan A by back-crossing with Sea Island cotton.

Evelyn, S. H. — *West Indies. Cotton Experiment Station, St. Vincent, Progress Report for the season 1937–38.* (*pp. 136–46*).

A randomized test of twelve V.135 progenies was carried out with 10 replications and 5 plants per plot. It was found that small differences which could not be relied on in non-replicated progeny row work were shown to be significant by this new technique.

The variation in commercially grown V.135 has been studied and the results will be reported in a separate paper.

Plants of V.135 have been preserved at Trinidad since 1928 by grafting. Seeds from these have been grown in St. Vincent and the resulting plants compared with present-day V. 135. The old V. 135 had lint 4 to 5 mm. shorter but had 6 per cent higher ginning outturn. The lint length of the old V. 135 was more variable.

Selection work on Red Sea Island progenies and on the V. 135 x Monserrat Sea Island Hybrids has been continued (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 863).

Attempts are being made to find a substitute for V. 135, the market for which is somewhat restricted.

Work on the Gambia x V. 135 and Asiatic x U.4 hybrids is to be abandoned.

Donald, D. A. — *Fiji. Cotton Experiment Station, Sigatoka, Progress Report for the season 1937–38.* (*pp. 147–50*).

The probability of the Government deciding to issue only Sea Island seed for commercial

production has altered the basis of selection. Further back-crosses with Sea Island have been made. J. L. F.

1308. Hutchinson, J. B., Panse, V. G. and Govande, G. K. 633.51:575(54) 633.51–1.421
Studies in plant breeding technique. IV. The inheritance of agricultural characters in three inter-strain crosses in cotton.
Indian J. Agric. Sci. 1938 : **8** : 757–75.

The F_1 and F_2 generation of all possible crosses involving three strains of *G. arboreum* var. *neglectum*, viz. Malvi, Bani and C 520, were grown with the parents in the same year in randomized blocks and observations were recorded on germination, node number, yield of seed cotton, staple length and ginning percentage. Statistical analysis of the results showed strong heterosis to be present in the case of all characters except germination, the direction of this heterosis bias being that which would be expected if heterosis were due to the effects of selection.

The F_2 progenies from sister F_1 plants showed significant differences in respect of the several characters, thereby demonstrating the existence of genetic variance within the parents. These differences were on the whole much greater in respect of characters not subject to direct selection (node number and germination) than those which were under selection (staple length, ginning percentage and yield).

Within-plot variances were calculated for the different characters under study. The results indicated that by far the greater part of the within-plot variances was environmental in origin and therefore single plant selection in progeny row breeding must be very inefficient.

It was concluded from the variances in F_2 that Malvi is more closely related to Bani than C 520. B. P. P.

1309. Mohammad Afzal, C. 633.51:575(54.5)
A new strain of desi cotton for south western tract of the Punjab.
Seas. Notes Punjab Agric. Dep. 1939 : **18** : 9–12.

The new cotton variety, 119 Sanguineum, has now been released by the Cotton Research Station, Lyallpur, Punjab. It is recommended for the south-western portions of the Punjab and has a ginning outturn of 35-36 per cent, higher than any other Sanguineum cotton. It is very early maturing, has white lint of attractive appearance, is drought resistant and gives high yields.

1310. Silow, R. A. 633.51:575.11:581.49
The genetics and taxonomic distribution of some specific lint quantity genes in Asiatic cottons.
J. Genet. 1939 : **38** : 277–98.

Genes epistatic to the lintless condition (h_a) in Asiatic cottons were discovered. Two major genes appeared to be present in the crosses studied, and their effect was to increase the number of hairs per unit area of seed surface. A single epistatic gene was found to increase the lint percentage on the lintless genotype by 6-10 per cent, while in the fully linted genotype its effect is less than one fifth of this value.

Other genes controlling lint development but hypostatic to the lintless gene also exist. The epistatic genes are widely distributed in *indica* strains of *Gossypium arboreum*, but are apparently lacking in forma *burmanica*, f. *bengalensis*, and certain other groups. The possibility of obtaining transgressive segregation for lint percentage by crossing varieties in which the character has different genetic bases is indicated.

1311. 633.51:575.113.3.061.1:581.45
Silow, R. A. 575.115
The genetics of leaf shape in diploid cottons and the theory of gene interaction.
J. Genet. 1939 : **38** : 229–76.

Two further allelomorphs of the *L* series of leaf shape genes (cf. "Plant Breeding Abstracts",

Vol. IV, Abst. 861) are identified, one, L^n, in a strain of *Gossypium arboreum* and the other, L^a in the wild species *G. anomalum*. The action of these genes and of shape determining genes in general is discussed at length. It is postulated that the locus in question contains two gene centres controlling laciniation and lobe width independently, and the action of the various allelomorphs is explained on the episome theory, there being up to three episomes present for laciniation and up to two for lobe width.

The question of dominance is also discussed at length and Fisher's theory of the evolution of dominance criticized. In the naturally occurring *L* allelomorphs dominance is in the direction of narrowness, but the mutant members of the series, which are relatively broad, are dominant over all others, though in each case dominance is incomplete. It is considered that dominance is an incidental effect of the action of natural selection on the genotype as a whole, the degree of dominance of a gene depending upon the magnitude of its effect relative to the possible range of the character affected and upon interactions with other genes working towards the same result.

1312. Knight, R. L. and Clouston, T. W. 633.51–2.3–1.521.6:575.127.2:575.11

The genetics of blackarm resistance. I. Factors B_1 and B_2.

J. Genet. 1939 : **38** : 133–59.

Crosses between Nye's Uganda B 31, an American Upland cotton resistant to blackarm (*Bacterium malvacearum*), and two strains of Sakel were made in order to transfer the resistance to Sakel. Repeated back-crosses to the Sakel parent were accompanied by selection for resistance in plants of Sakel type. Data are presented which show that the resistance of B 31 is due to two pairs of dominant, cumulative genes, B_1 and B_2. It is believed that B 31 also carries additional modifying genes for resistance. The data were obtained on the basis of observations of leaf resistance only, but this was shown to be positively correlated with stem resistance.

1313. Deshpande, R. B. 633.52:575.11.061.633:575.242

A note on the occurrence of a chlorophyll deficiency in linseed (*Linum usitatissimum* L.).

Curr. Sci. 1939 : **8** : 168–69.

A chlorophyll deficient mutant form which arose in a field of the linseed variety, Pusa Type 12, proved to be inherited as a simple Mendelian recessive. There was a small deficiency of the mutant type in crosses, which is attributed to the death of some of the weaker zygotes.

1314. Nandi, H. K. 633.523:576.356.4:576.312.38

Cytogenetical studies in jute.

Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt. III : Sect. Bot. : Abst. 20 : 142–43.

A trisomic (15-chromosome) jute plant occurring in a diploid culture is described. This plant, when selfed, produced a large number of trisomics, but when used as the male parent in crosses with normal plants, the percentage of trisomic plants in the progeny was considerably reduced thereby showing that egg cells with one extra chromosome were more effective in fertilization than pollen of the same constitution.

The basic chromosome number of *Corchorus capsularis* is suggested to be 5 from observations of secondary association. B. P. P.

SUGAR PLANTS 633.6

1315. Dutt, N. L. 633.61:575(54.8)

New cane varieties from Coimbatore.

Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt. III : Sect. Agric. : Abst. 30 : p. 219.

Attention is drawn to the new varieties of thick canes Co. 419 and Co. 421. The former promises to be useful for tropical India and the latter for certain parts of sub-tropical India. B. P. P.

1316. McIntosh, A.E.S. 633.61:575(72.92+72.98)
Report on a second visit to Jamaica, October, 1938.
Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1938 : No. 19 : Pp. 15.

Inter alia, an account is given of some of the new varieties of sugar cane bred at the British West Indies Central Sugar Cane Breeding Station in Barbados and recently introduced, and suggestions are given for improving the present methods of multiplying and testing such varieties in Jamaica.

1317. McIntosh, A. E. S. 633.61:575(72.98)
Report on sugar cane breeding and seedling testing for the year 1937–38.
Agric. J., Barbados 1938 : **7** : 97–121.

Anonymous.
Fifth Annual Report of the British West Indies Central Sugar Cane Breeding Station, Barbados, for the year ending September 30, 1938:
Pp. 31.

Details are given of the crosses made at the British West Indies Sugar Cane Breeding Station during the year, and of the behaviour of the seedlings under test.

The Hawaiian method of hybridization, according to which the parent canes are cut and allowed to stand in a weak solution containing sulphurous and phosphoric acids, was tried for the first time. The test was unsuccessful since the fuzz obtained failed to mature, but the method is to be tried again in the open air instead of in the shelter of a building.

The nobilization of Java *Saccharum spontaneum* has now reached the sixth degree and seedlings resemble noble canes in appearance. It appears highly probable that noble type seedlings will be obtained with commercial resistance to mosaic disease.

Among the newer canes now recommended for trial commercial plantings are B.3127 and B.3439. B.3127 may be suited to the thinner types of red soils chiefly on account of its strong ratooning powers in such conditions. B.3439 shows great promise for black soils, but appears to have too short a growth season for use on the red soils.

Tests were made of the varieties B.3254 and B.35187 on small holdings in areas infected with mosaic disease, and neither has so far shown any signs of the disease.

Some of the seedlings obtained in the early stages of nobilization are being tested as fodder canes.

1318. Janaki Ammal, E. K. 633.61:575.127.5:633.174:576.354.4
Chromosome behaviour in *Saccharum spontaneum* x *Sorghum durra* hybrids.
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt. III : Section Bot. : Abst. 21 : p. 143.

Out of thirteen hybrids between *S. spontaneum* ($2n = 56$) x *Sorghum Durra* ($2n = 20$), twelve were diploids ($2n = 38$) and one was a triploid ($2n = 66$). The characteristic "A" chromosomes of the genus *Sorghum* were identified in all the plants. Meiosis in these hybrids is described. B. P. P.

1319. K . . ., H. W. 633.61–2.411.4–1.521.6:575(94.3)
The variety Q. 20 in the Mackay area.
Cane Gr. Quart. Bull. 1939 : **6** : p. 190.

The variety Q. 20, a seedling of Badila bred at the Mackay experiment station, Queensland, will shortly be released to growers if it continues to confirm present opinions in trial plots. The variety gives moderately good yields, and apparently superior ratoon yields, arrows rarely and is resistant to downy mildew. It gives extraordinarily sweet and pure juices during mid-season.

1320. Isaac, P. V. 633.61–2.7–1.521.6(54)
How mid-rib hardness affords resistance to the sugarcane top-borer *Scirpophaga nivella* F., in India.
Curr. Sci. 1939 : **8** : 211–12.
Varieties of sugar cane with a hard mid-rib in their leaves were found to be resistant. The mechanism of this resistance is discussed.

1321. 633.61.00.14(72.9)
633.61–1.557(72.9)
The yield of sugar cane in Barbados in 1938.
Bull. B.W.I. Cent. Sug. Cane Breed Sta. 1939 : No. 20 : Pp. 10.
The results of sugar cane variety trials conducted in Barbados during 1938 are recorded. In the high rainfall area it is notable that the new seedling B.3013 exceeded the standards B.726 and B.H.10 (12) in yield, more particularly in the first ratoons.

STIMULANTS 633.7

1322. Kostoff, D. 633.71:575.127.2:581.162.5:576.356
Lethality of gametes conditioned by exchange of segments between partially homologous chromosomes in a *Nicotiana* species hybrid.
Curr. Sci. 1939 : **8** : p. 260.
The hybrid *Nicotiana Raimondii* ($n = 12$) x *N. Tabacum* ($n = 24$) showed 3–6 bivalents per pollen mother cell when examined in April, 1939. Cells with as few as two bivalents were rarely found. From 12 to 15 per cent of dyad microspores occurred, usually as a result of the formation of restitution nuclei, but there was no viable pollen. Therefore both the reduced nuclei and the unreduced ones, which contained the sum of both haploid parental complements, failed to function. The author assumes that the unreduced pollen grains were rendered lethal by the occurrence of exchange of segments between the partially homologous chromosome pairs. This hypothesis is supported by observations on plants growing in cooler conditions in the autumn of 1938, when 0–4 bivalents were found in pollen mother cells of the hybrid, 5 per cent of the cells showing complete asyndesis. These plants formed 0·4 per cent of viable pollen grains, held to be derived from pollen mother cells in which no pairing and consequent interchange of segments had occurred.

1323. Kostoff, D. and 633.71:581.036:575.242:576.356
Sarana, M. 633.71:576.16
Heritable variations in *Nicotiana Tabacum* L. induced by abnormal temperatures, and their evolutionary significance.
J. Genet. 1939 : **37** : 499–547.
Plants of *Nicotiana Tabacum* var. *macrophylla* were subjected to extremes of temperature, and abnormal plants grown from their seed were in turn subjected to similar treatment. This caused irregularities in chromosome behaviour, resulting in the production of plants with from 47 to 52 chromosomes, with additional fragments in some cases.
Various structural changes were produced in the chromosome complements as a direct result of the treatment or secondarily as a result of chiasma formation involving changed or monosomic chromosomes, and the progenies showed wide variation in fertility and in morphological, physiological and biochemical characteristics. Further variants were produced by intercrossing extreme variants in the above families. Many of these are described in detail, and the ways in which heat treatment leads to the various types of cytological alteration observed are discussed. Some of the variants resembled in some respects one or other of the species *N. silvestris* and *N. tomentosiformis* from which the allotetraploid species *N. Tabacum* is considered to have arisen.
The probable significance of extremes of temperature in inducing variation in nature is discussed.

1324. Norris, R. V. 633.72:575(54.8)
The work of the Tea Research Institute.
Tea Quart. 1939 : **12** : 5–15.
The Physiological Section, which was formerly concerned primarily with pruning problems, is now concentrating on tea selection and propagation. There is great plant-to-plant variation in the tea populations at present grown in Ceylon, and it would appear to be relatively simple to effect a great improvement in yield coupled with an improvement in quality.

1325. 633.72:575(54.8)
Tubbs, F. R. 633.72:581.165:575.42(54.8)
The improvement of planting material.
Tea Quart. 1939 : **12** : 38-47.
Instructions are given to planters for the selection of vigorous seed-bearing bushes and also for the selection and yield testing of bushes to be used for the establishment of improved clones. When such parent bushes have been selected, planters are invited to send cuttings to the Tea Research Institute, where quality tests will be carried out on promising clones. A method for the vegetative reproduction of tea is described.

1326. Tubbs, F. R. 633.72:575.42:581.165.1(54.8)
Report of the plant physiologist for 1938.
Bull. Tea Res. Inst. Ceylon 1938 : No. 19 : 38–56.
Studies of four seedling tea populations of differing parentage revealed great variability in vigour within each. Five seedlings of outstanding vigour were selected for clonal propagation. Selection of high-yielding bushes for subsequent tests as clones has continued and some 2,000 have so far been made the subject of yield records. Numerous estates are co-operating with the Institute in this work.
Studies in the vegetative propagation of tea have been continued and the results are reported, and studies have also been made of the fruiting habits of seed bearers.
Attempts are being made to produce polyploid seed bearers by the use of gamma rays and colchicine.

1327. 633.73:575(54.8)
633.83:575(54.8)
Progress report of work done on the Coffee Experiment Station, Balehonnur, for the period 1932 to 1936.
Bull. Mysore Coffee Exp. Sta. 1939 : No. 18 : Pp. 41.
Selfed progenies of mother plants selected from the collection assembled at the Station are under test; in six cases second generation selfed progenies are already being grown. The aim is to obtain homozygous strains with desirable characters.
Most of the selected mother plants have also been crossed with pollen from Kent or Coorg type plants and some of them have also recently been crossed with Maragogipe.
Collections of Robusta, Java and other types of coffee have been made, and individual plant yields are being recorded for the Robusta forms. Some of the latter have been selected as mother plants and their progenies by open pollination are under test. The mother plants failed to produce seed on selfing.
Many crosses have been made using Robusta plants as male and female parents. In the case of crosses with Kent plants, seeds are only set when Robusta is used as the male parent.
Experiments are being conducted to compare the behaviour of pea berry and flat bean coffee seeds and also to determine the best methods of vegetatively propagating the crop. Manurial and cultural experiments are also under way.
Collections of various fruits are being made at the Station. In the case of cardamoms, five upright and five trailing varieties have been collected from Mysore, Madras and Bombay and forty plants have been selected from them. Breeding work on the good bearers among these will be taken up shortly.

1328. 633.74:575(72.98)
POUND, F. J. 633.74–2.472.3–1.521.6
The present position of fertilisers and cocoa. Lecture to the Agricultural Society of Trinidad and Tobago.
Proc. Agric. Soc. Trin. Tob. 1939 : **39** : 98–105.

In the second part of this paper cacao breeding work in Trinidad is discussed. Seedling progenies have been obtained that approach the parent selection in yielding ability, but they show considerable segregation. Promising clones of self-compatible trees are also being grown, one of them having given an average yield of 1,200 lb. per acre from the time the trees were ten years old.

The witch-broom resistant selections obtained in Ecuador have now been removed from quarantine and grafted on stocks in Trinidad. Only 10 per cent of them have so far proved susceptible. Some of the selections from the Amazon valley show very great vigour of growth in Barbados. They have not yet been tested in Trinidad.

1329. 633.74–2·472·3–1.521.6(86)
633–2–1.521.6
The control of plant diseases. The value of immune or resistant types.
Gold Cst Fmr 1939 : **8** : 81–82.

Particular reference is made in this editorial to the expedition of Dr F. J. Pound to Ecuador and the Amazon valley in search of cacao trees resistant to *Marasmius* (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 77).

1330. SALMON, E. S. 633.79:575.242:581.45
On a tricussate arrangement of the leaves and flowering branches in certain seedlings of the hop.
J. S.-E. Agric. Coll. Wye 1939 : No. 44 : 9–11.

Two hop seedlings, one male and one female, which have a tricussate instead of a decussate leaf arrangement are described.

AROMATIC PLANTS 633.8

1331. DESHPANDE, R. B. 633.842:575.11.061.6:581.466
Studies in Indian chillies. 5. Inheritance of anther colour and its relation to colour in petal and node in *Capsicum annuum* L.
Indian J. Agric. Sci. 1939 : **9** : 185–92.

DESHPANDE, R. B.
Colour inheritance studies in Indian chillies (*Capsicum annuum* L.).
Proc. 25th Indian Sci. Congr. Calcutta 1938 : Pt. III : Sect. Agric. : Abst. 15 : p. 214.

The yellow anthers of the variety T 11A were found to be recessive to the yellowish purple ones of T 29 and to the deep purple anthers of T 3. Coloured anthers were completely linked with purple nodes and the same factor is responsible for colour in these two parts. Petal colour segregated independently of anther colour. B. P. P.

OIL PLANTS 633.85

1332. NABI, M. M. 633.853.49:575.42(54.5)
Future of oil-seeds in the Rawalpindi Circle.
Seas. Notes Punjab Agric. Dep. 1939 : **18** : 15–16.

A further description of the new type of raya (*Brassica juncea*), O.B. No. 1, already described in "Plant Breeding Abstracts", (Vol. IX, Abst. 619).

1333. Richharia, R. H. and
Kalamkar, W. J. 633.854.54:576.312.35(54)
Chromosome number in Indian linseed, *Linum usitatissimum* L.
Indian J. Agric. Sci. 1939 : **9** : 561–64.
Root-tips of six Indian varieties of linseed were examined and the diploid chromosome number was found to be 30. B. P. P.

MEDICINAL PLANTS 633.88

1334. Asana, J. J. and 633.88:576.312.35
Sutaria, R. N. 633.689:576.312.35
On the number of chromosomes of some Indian Araceae.
J. Univ. Bomb. 1939 : **7** : 58–62.
The species examined include the following: *Amorphophallus campanulatus*, $2n = 26$; *A. sylvaticus*, $2n = 26$ and *Colocasia esculenta*, $2n = 28$.

RUBBER PLANTS 633.91

1335. 633.912.00.15(92.2)
West Java Experimental Station, Buitenzorg.
Bull Rubb. Gr. Ass. 1939 : **21** : 240–48.
The work of the Station, which includes breeding work on rubber, is briefly described.

FRUIT TREES 634

1336. Hrubý, K. 634.23:576.356.5:576.16
The cytology of the Duke cherries and their derivatives.
J. Genet. 1939 : **38** : 125–31.
The cytological relationships of Duke cherries ($2n$ -- 32), sour cherries (*Prunus Cerasus*, $2n = 32$) and sweet cherries (*P. avium*, $2n = 16$) were studied. Duke cherry varieties show 6–7 quadrivalents in most cells and behave as autotetraploids. In crosses of Duke with sweet cherries, a full complement of eight trivalents was observed in about one third of cells, so that the hybrids behaved as autotriploids. It therefore seems not unlikely that Duke cherries are autotetraploid forms of *P. avium*.

CITRUS FRUITS 634.3

1337. 634.3:575(94·4)
Benton, R. J. 634.3:575.247
Citrus improvement. Bud selection and propagation of varieties. Ten years' progress.
Agric. Gaz. N.S.W. 1939 : **50** : 143–45, 174, 214–18.
The citrus improvement work conducted at the Departmental Nursery at Narara, New South Wales, during the last ten years is described.
Bud wood of local "strains" of citrus that had a specially high reputation was grafted on to stocks grown in the experimental orchards and it was concluded that their special qualities were due to environmental factors and that when grown under standard conditions they appeared to be typical of the varieties concerned.
Four years' yield recording of many individual trees of Washington Navel and Valencia Late orange was completed in 1928. Some of the vegetative progeny of high-yielding trees, grafted on rough lemon stocks, are now being recorded but it is too early yet to tell whether they represent any real improvement.
Many vegetative mutations and fluctuations have been observed during the course of the above work, e.g. variegated foliage, corrugated fruit, vigorous growth, navel Valencia type, late maturity. One of the vigorous growing mutants appears to be of some promise, but of 76 selections of navel Valencia type none has proved to be stable.
A trial designed to eliminate some of the confusion at present existing in the nomenclature of lemon varieties has been started.
Efforts are being made, by selecting bud wood from exceptionally old trees, to produce a strain of Eureka lemon with greater longevity than the present type.

No variation between strains has so far been observed in bud selections of the Marsh and Wheeny grapefruit varieties. Orchards of Emperor mandarin, on the other hand, showed considerable variation in type, due to propagation from plants of seedling origin. The variants did not differ markedly in acidity or juice content, though some were inferior in form of fruit or in other ways.
Strains of Ellendale Beauty and of Poorman orange that were reputed to be seedless were found to owe that condition to the fact that they were not planted near to other varieties and were therefore not cross-fertilized. Their seedlessness was not due to any genetic peculiarity.

PALMACEOUS AND OTHER FRUITS 634.6

1338. Pieris, W. V. D. 634.61:575(54.8)
Geneticist's report for 1936.
Bull. Coconut Res. Scheme (Ceylon) : No. 4 : 1–17.
Yield recording on a large number of selected mother coconut palms was continued, and the results are tabulated. It is noted that high-yielding palms suffer less from drought than poorer sorts. The relation that the weight of copra is equal to approximately 32 per cent of the weight of husked nuts is found to remain remarkably constant, and the weight of nuts is now used as a measure of the yield of copra in making selections.
A preliminary experiment is being conducted to determine the relative merits of seed nuts taken from the first and second bunches. No significant difference in the vigour of the resultant seedlings is yet discernible. The preliminary results of other coconut experiments are also briefly reported.

1339. 634.61:575(54.8)
Pieris, W. V. D. 634.61:519.241.1
Geneticist's report for the year 1937.
Bull. Coconut Res. Scheme (Ceylon) : No. 4 : 19–57.
The results of a study made to determine the correlations existing between the yield of selected coconut palms and the rainfall of the preceding year are recorded. The effect of drought in the preceding year was least marked on the highest yielding palms.
The correlation between the number of female flowers set and the number that develop into mature nuts was also studied. This correlation is only close when there are fairly small numbers of female flowers.
Further data are presented with regard to the weight of copra: weight of husked nuts relation.
Preliminary data relating to dwarf palms in Ceylon are presented and details are given of the behaviour of these palms in other countries. It is considered that they may be an economical source of toddy and also that there is no reason to suppose that in Ceylon the quality of copra produced would be less than that of tall palms. A more detailed study of dwarf palms is to be made.
Yield recording on selected palms is being continued; 484 palms were under observation at the end of 1937. It is shown that although there is in general a negative correlation between the size of nut produced and the number of nuts, this is by no means rigid and there is very considerable scope for selection for increased yield. Some individuals have given a yield equivalent to $2\frac{3}{4}$ tons (11 candies) of copra per acre of 60 palms.
Studies are being made of correlations between seedling characters and the characters of the adult palm.
A new experimental area is being opened up and it is hoped to establish on it palms grown from nuts of which the male as well as the female parentage is known.

1340. 634.61:575.125:575.14
Patel, J. S. 634.61:575:578.08
Coconut breeding.
Proc. Ass. Econ. Biol. Coimbatore 1937 : **5** : 1–16.
A comparison was made of the seedling vigour of coconut progenies raised from selected parent trees by (1) controlled cross-pollination, (2) open pollination and (3) selfing. In no

instance did the selfed exceed the cross-pollinated progenies in vigour and in some cases they were inferior. The results indicate that hybrid vigour is met with in the coconut and it is therefore considered that inbreeding is not a promising method of improving the crop. The testing of a large number of controlled crosses between selected mother trees is regarded as the best approach, though some improvement may be effected by taking naturally pollinated nuts from plantations from which inferior palms have been rigidly excluded.

1341. 634.651:577.8:575.116.7

Pawpaw sex-linked inheritance.

Fmr's Wkly, Bloemfontein 1939 : **57** : p. 1395.

A report of a paper read by J. D. J. Hofmeyr, in which the possibility of using a sex-linked character to distinguish the sexes of seedlings of papaya was discussed. No sufficiently closely linked character has yet been discovered. A case of sex reversal in a pistillate tree was reported.

SMALL BUSH FRUITS 634.7

1342. Lewis, D. 634.711:575.11:575.116.1:575.113.7

Genetical studies in cultivated raspberries. I. Inheritance and linkage.

J. Genet. 1939 : **38** : 367–79.

Four new genes are described, viz. *s*, spineless shoots; *b*, shoots without waxy bloom; *x*, red hypocotyl and *d*, sepaloid flowers. Additional data for certain previously known genes are also given, and reference is made to the irregular segregations recorded for *T* and *G* (cf. Abst. **1343** below).

The gene *H* (hairy plants) appears to be closely linked to a lethal gene and gives a 2 : 1 instead of a 3 : 1 ratio in F_2.

The genes *T* (red fruit and spines), *B* (waxy bloom on stem), *G* (green leaf) and *X* (green hypocotyl) form one linkage group.

The sepaloid character is not inherited simply, there being considerable variation in the sepaloid class although it appears that one basic recessive gene is chiefly responsible.

1343. Lewis, D. 634.711:575.116.1:581.331.23

Differential fertilization in *Rubus Idaeus* L.

Proc. Genet. Soc. [Supplement to J. Genet. 1939 : **37**(3)] : p. [3]. (Abst.).

Significant heterogeneity and deviations in the segregations of *T* v. *t* (fruit colour) and *G* v. *g* (chlorophyll deficiency) were observed in F_2 families and in back-cross families in which the male parent was heterozygous. These abnormal segregations were due to a gene, *w*, which is linked to *T* and *G* and which inhibits or retards pollen-tube growth. The order of the genes appears to be *TGW*. There is some evidence that the differential effect of *w* on pollen-tube growth may depend on the genetic constitution of the stylar tissue.

OTHER FRUITS 634.771

1344. Wardlaw, C. W. 634.771–2.484–1.521.6:575(72.98)

Cercospora leaf spot disease of bananas.

Nature, Lond. 1939 : **144** : 11–14.

A description of the disease is given. Many wild bananas appear to be highly resistant and this resistance has been inherited in the hybrids between cultivated and wild bananas bred in Trinidad in an attempt to produce forms resistant to Panama disease. Eight such varieties are highly resistant to both diseases. It appears that the best hope of producing an export banana resistant to Panama disease and *Cercospora* lies in crossing Gros Michel with appropriate wild types.

1345. 635.3:576.356.5:581.48:575–181
HOWARD, H. W. 635.3:581.481
The size of seeds in diploid and autotetraploid *Brassica oleracea* L.
J. Genet. 1939 : **38** : 325–40.

Seeds from autotetraploid *B. oleracea* exceeded diploid seed by about 30 per cent in weight.

The cross diploid ♀ x tetraploid ♂ gave small, shrivelled seeds without embryos. The reciprocal cross gave small, triploid seed less than one third of the weight of the corresponding diploids, their small size being attributed to the abnormal endosperm : embryo relation. Eleven small seeds were also obtained among the normal seeds from diploid selfs and crosses. Five of these were triploid, presumably resulting from the fertilization of diploid embryo-sacs, and the fact that they were of the same size as triploid seeds from tetraploid x diploid crosses shows that it is not the relationship with the mother plant, but the relationship between the endosperm and embryo which is most important in determining seed size.
From the cross diploid ♀ x tetraploid ♂ two exceptional large seeds were obtained, both of which proved to be tetraploid and presumably arose by the fertilization of unreduced embryo-sacs.
Fifty-four double seeds of marrow-stem kale all had diploid embryos with one exception, in which a tetraploid and a diploid embryo were found.

1346. DOUGLASS, J. 635.64:575.42:581.143.32
Selection of tomato seedlings. Discard "buck" plants.
Agric. Gaz. N.S.W. 1939 : **50** : 305–06.

"Buck" plants occur in certain tomato varieties, particularly those belonging to the Chinese group. They are characterized by their short internodes, abundance of lateral branches and distortion of the flower and fruit bunches. The seedling characters of such plants are described to enable the grower to eliminate them in the nursery.

1347. BOSE, R. D. 635.652:575.11
The genetics of Mung (*Phaseolus radiatus* Linn.).
Proc. 25th Indian Sci. Congr. Calcutta 1938. Pt. III : Sect. Agric. : Abst. 14 : p. 213.

Olive-yellow flowers and shining seed surface behave as simple recessives to light yellowish olive flowers and dull seed surface respectively. Two genes are concerned in the inheritance of seed-coat colour.
Transgressive segregation was observed in respect of maturity and length and diameter of the pods. The colour of the unripe pod was found to be completely linked with that of the flower.

B. P. P.

1348. 635.655:575(68)
ADLER, E. 635.654:575(68)
New varieties of soybeans and cowpeas.
S. Afr. Sug. J. 1939 : **23** : p. 205.

A reprint of the article summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 632.

1349. IYENGAR, N. K. 635.657:576.312.35:576.312.38:576.356.5
Cytological investigations on the genus *Cicer*.
Ann. Bot., Lond. 1939 : **3** : 271–305.

The chromosome number of 30 varieties of *C. arietinum* was $2n = 16$, and of two varieties of *C. songaricum*, $2n = 14$. The course of meiosis and mitosis in both species is described, and it is concluded that both are allotetraploid. Four satellited chromosomes are present in the somatic nuclei of both species. In *C. arietinum* secondary association was observed, the maximum association of $1(3)+2(2)+1(1)$ indicating that the basic chromosome number of the species is four. Various meiotic irregularities were found.

Part II. Foreign.

STATISTICS 519

1350. Hendricks, W. A., Quinn, J. P. and Godfrey, A. B. 519.24:575.11
Interpretation of Mendelian class frequencies.
J. Agric. Res. 1939 : **58** : 755–60.

The authors discuss critically the principles involved in applying the χ^2-test to observational data in order to test compatibility with postulated Mendelian class frequency ratios. They supply a table giving what is called the normal range of variation for different numbers of degrees of freedom, i.e. the shortest range of values which will include 95 per cent of observed cases. J. W.

1351. Covas, G. and Sívori, E. M. 519.24:631.421
Eficiencia en ensayos comparativos de rendimientos planeados según el método de "blocks incompletos simétricos". (**Efficiency of comparative yield tests based on the incomplete symmetrical block method**).
Rev. Argent. Agron. 1939 : **6** : 126–30.

The author describes four trials in which 16 varieties of flax were grown in five-fold replication, and compares a lay-out in (4 x 5) incomplete randomized blocks with the corresponding lay-out in 5 complete blocks. In one of the trials the relative efficiency of the incomplete blocks lay-out was 108 per cent, but in the other three it varied between 79 per cent and 85 per cent. The conclusion is reached that in this series of trials, conducted under homogeneous soil conditions, and with only a moderate number of varieties, no clear advantage is derived from using the method of incomplete blocks. J. W.

1352 Tedin, O. 519.24:631.421
Systematisk eller slumpmässig parcellfördelning vid fältförsök. (**Systematic or random arrangement of plots in field experiments**).
Nord. JordbrForskn. 1938 : No. 8 : 137–48.

The work of Fisher, Gosset and others is discussed in relation to the merits of the use of the Latin square or of randomization in field experiments.

1353. Borden, R. J. 519.24:631.421:633.61
Studies in experimental technique: plot arrangement.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 733–44.

A series of studies of uniformity trials with sugar cane, designed to test the effect of various plot arrangements upon the accuracy of the yields of a number of sub-series (treatments), is examined, and it is shown that greater accuracy is not obtained from random as opposed to balanced arrangements. The conclusion is reached that balanced arrangements can be used without introducing bias, or losing any significant degree of accuracy in the interpretation of the results. J. W.

1354. Kerr, H. W. 519.24:631.421:633.61
Notes on plot technique.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 764–78.

This paper consists of a description with statistical data derived from certain uniformity trials, of plot trial technique with sugar cane in Queensland. In particular, size and shape of plot, the effect of block arrangements in reducing variability, and border influences, are discussed. J. W.

1355. Weiss, M. G. and
Cox, G. M. 519.24:631.421:635.655
Balanced incomplete block and lattice square designs for testing yield differences among large numbers of soybean varieties.
Res. Bull. Ia Agric. Exp. Sta. 1939 : No. 257 : 291–316.
A useful description, with full arithmetical details, of two quasi-factorial arrangements for field experiments, namely the balanced incomplete block and lattice square designs. The methods are illustrated from soybean variety trials. It is shown that on soil of normal variability the elimination of soil heterogeneity permitted by the designs more than offsets the loss in efficiency due to confounding. These designs are recommended for trials of a large number of varieties conducted on variable soil, where the expected differences are relatively small. J. W.

1356. Arceneaux, G.,
Stokes, I. E.,
Belcher, B. A. and
Gibbens, R. T. (Jr) 519.271.3:631.421:633.61
A study of the relation between size of field sample and experiment errors of juice analysis and sugar-yield determination in connection with sugarcane variety tests.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 744–59.
A statistical analysis is carried out of the data obtained from certain sugar cane experiments by sampling from 5 to 40 stalks per plot of $\frac{1}{40} - \frac{1}{60}$ acre. While errors due to random variation of individual stalks may be reduced by increasing the number taken per sample, it is shown that differences between plots due to soil or other environmental factors contribute materially to experimental error. The estimate of juice analysis, and consequently of sugar yield, is shown to be improved by a balancing of varietal series according to the Latin square scheme. Good results for yield of sugar per ton of cane were obtained from 3 stalk samples but larger samples are recommended, though they need not be so large as the customary sample of 30 stalks. J. W.

1357. Holmes, R. L. and
O'Neal, A. M. 519.271.3:631.421:633.61
A study of the number of stalks of cane required for accuracy in sampling experimental plots.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 760–64.
When only a single sample can be taken from each experimental plot of cane for analysis, it is important to determine how large the sample ought to be. The results of an investigation of this character are described, and it is concluded that under the conditions of the experiment studied, in which the plots were 24 x 30 feet, a 20–30 stalk sample would be best. J. W.

BREEDING 575.

1358. Rudorf, W. 575:633
Warum Züchtungsforschung an den Kulturpflanzen? **(Why breeding research with crop plants ?)**
Umschau 1939 : **43** : 743–47.
The success of recent introduction work is illustrated by reference to the white lupin (*Lupinus albus*), of which sufficiently early forms for north Germany have now been found, as well as forms with low alkaloid and high oil content.
Breeders are now devoting attention to the genetics of yield and of resistance to a variety of unfavourable conditions and in particular to the individual components which build up each of these complex characters. The importance of the "gene centres" for this work and the role of polyploidy in connexion with species hybridization are discussed and the importance of testing breeding material in the areas for which it is designed is emphasized.

1359. 575:633(47)

(The All-Union Congress on Breeding and Seed Production).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 4 : 26–37.

The following papers were read at the Congress:—

Frenkel, A. I. (*Results of work of the State Breeding Stations in* 1938 *and their immediate problems*). (*pp.* 26–30).

The present organization of plant breeding work in the Soviet Union is reviewed. The earlier system is criticized as having neglected the possibilities of improvement within a pure line variety; of having failed to consider the practical needs of the growers and to provide the necessary system of seed production; and having overlooked the importance of environmental factors and of local races. The present system of seed production is described, the yields obtained by the various breeding stations in 1938 and the quality of their seeds are indicated and the main problems confronting Soviet plant breeders at the moment are outlined.

(*The paper by A. I. Deržavin*). (*pp.* 30–32).

Experiments on intraspecific hybridization, variety tests and seed production are receiving special attention. From Ukrainka, plants with higher rust resistance and yield have been selected. A special study has been made of the local races of spring and winter wheat and barley and selections are being made. Promising forms of spring *Triticum durum* have been obtained in this way; similarly, lines of winter wheat surpassing Kooperatorka by 5–7 c. per ha. have been selected. Rust-resistant selections of Kanred x Fulcaster and Illini Chief have been produced and have exceeded the standards in yield. Other selections include a naked barley exceeding the standard in yield by 10 per cent.

The hybrids of wheat with perennial rye when pollinated with normal pollen set seed mainly from unreduced egg cells. Large numbers of amphidiploids are expected and the work of producing them is being carried out on a mass scale by the workers in the collective farms. The perennial hybrids all have one serious defect, brittle ears, but are drought resistant and of good baking quality.

Hybrids have been obtained between cultivated and wild sunflowers, some of which bear both seeds and tubers.

(*The paper by A. V. Pukhal'skii*). (*pp.* 32–34).

The main work of the Šatilovo breeding station consists of intravarietal crossing, repeated selection and raising the seed under intensive conditions of cultivation. The variety Erythrospermum 0917 is known not to be pure; intravarietal crossing in this variety has led to an increase in yield of 3·9 c. per ha.; an increase in vitreousness is also reported. Certain hybrids of *Triticum dicoccum* x *T. durum* have proved promising.

(*The paper by P. P. Luk'janenko*). (*pp.* 34–36).

The Krasnodar breeding station's new winter wheat Krasnodarka, which is more rust-resistant than the varieties previously grown, has exceeded them in yield by 8–11 c. per ha.; it is equal or superior to Ukrainka in baking quality.

By crossing Ukrainka with Marquis a new winter wheat, Novo-Ukrainka, far surpassing the old Ukrainka and even Krasnodarka in yield, has been obtained; it is also resistant to brown and yellow rust and moderately resistant to stem rust and has very high baking quality; it is winter-hardy and free from lodging and shedding.

Many selections of local winter wheats resistant to brown and yellow rust have been made, and high yielding forms of the local four-row barleys have also been selected.

In the amphidiploid *Triticum-Agropyron* hybrids a valuable new herbage plant has been obtained.

(*The paper by Zalesov*). (*pp.* 36–37).

Selection and seed production have been carried out in cereals and other crops; also intravarietal crossing.

1360. Kerefov and Kupermann. 575:633(47)
(The Kabardino-Balkar State Breeding Station).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 4 : 20–22.
The main breeding problems facing the station are outlined and the most promising parental varieties are indicated. Selection for disease resistance is being carried out on a large scale and combined with intravarietal crossing.

1361. 575:633(47)
Lewicki, S. 575.12:575.148
O niektórych szkodliwych prądach rosyjskiej genetyki i hodowli roślin.
(Some detrimental trends in Russian genetics and plant breeding).
Przegl. Doświad. Roln. (Rev. Agric. Res.) 1938 : **1** : 261–65.
The author refers to the views of Lysenko and his school and points out that his conclusions are based on very inadequate experimental data and that many of the results support rather than invalidate the Mendelian laws.
Experiments are being started at Puławy to test his new technique of crossing and the method of "regeneration" of old varieties.

1362. Odnokon', Ja. M. 575:633(47)
(The Amur State Breeding Station).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 4 : 22–24.
The station has produced several improved varieties of spring wheat; intravarietal crossing is now being applied extensively. Improved varieties of soya bean have also been obtained, and efforts are now being made to combine early maturity and high yield.
Improvement is also being effected in a number of other crops.

1363. Povolotskaja, E. E. 575:633(47)
(The Kuban Experiment Station of the Institute of Plant Industry).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 4 : 24-25.
Among the new varieties produced by the station special mention is made of the winter wheat Otrada [Consolation] from Kanred x Fulcaster, characterized by large, heavy grain and resistance to *Ustilago* and to Hessian fly.
The station has also produced improved varieties of barley, lucerne, linseed, sorghum and soya bean. The soya bean Kubanskaja 276 is drought resistant, and has a high content of oil and protein and a lower content of cellulose, husk and catalase than the standards.
Two varieties of *Cicer arietinum* resistant to *Ascochyta* have been bred, one of these, Kubanskii No. 199, being distinguished by high yield.

1364. Pukhal'skii, A. V. 575:633(47)
(Forty years of scientific activity of the Station).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 5 : 30-32.
A brief account is given of the work of the Šatilovo Station since its inception in 1896, of the many improved varieties of agricultural plants it has produced and of its present organization.

1365. 575:633(47)
Teterev, F. K. 634:575.127
(Works of young Soviet improvers of nature).
Priroda (Nature) 1938 : No. 10 : 81–84.
Among the achievements of the new school of biologists, the followers of Darwin, Michurin and Lysenko, reference is made to the production of a high-quality frost resistant sweet cherry, of high-quality hardy filberts from crosses of cultivated with wild species, of hardy grapes by using *Vitis amurensis*; also of a number of new improved seedless grape varieties, of valuable "graft hybrids" in potatoes, hybrids of sunflower with Jerusalem artichoke, hybrids between Japanese bird cherry (*Prunus virginiana*) and high-quality sweet and sour cherries, and of the sour cherries with *Cerasus incana* Stev.

Hybrids have been obtained by pollinating the sour cherry with a mixture of pollen from almond (*Amygdalus nana*) and sweet cherry and by pollinating *Cerasus tomentosa* Well. with a mixture of pollen of southern varieties of apricot, although in the latter case pollination with unmixed pollen gave no set at all.
Advances have been made in the study of vernalization, selective action of the ovule, etc.; it has been found that in crossing local with foreign wheats the best results are obtained when the local form serves as maternal parent.

1366. Nilsson-Leissner, G. 575:633(48.5)
Organisationen av jordbruksförsöksverksamheten och växtförädlingen i Sverige. (**The organization of agricultural activities and plant breeding in Sweden**).
Tidsskr. Landøkon. 1939 : No. 6 : 441–55.
The history and organization of the institutes and associations concerned with agriculture and plant breeding in Sweden are briefly described.

1367. 575:633(61)
Compte-rendu des travaux entrepris pendant la campagne 1936–1937. (**Report of the work undertaken during 1936-1937**).
Bull. Direct. Affaires Écon., Tunis 1938 : **42** : 157–228.
The department of genetics is occupied with making 2 or 3 excellent lines of the wheat cross Florence x Aurore available to growers and also in working on the improvement of wheat for hardiness, disease resistance and baking quality. A number of soft wheats have been introduced from all over the world and crosses have been made to increase production, for resistance to rust and lodging and for better baking quality.
Selection has been begun on the varieties introduced in 1936.
With regard to baking quality figures are given for the value of W for lines of Florence x Aurore, lines of Pusa and for a number of hybrids.
With hard wheat (*T. durum*), crosses have been made between the late local wheats and some early varieties introduced from Greece and selection has been begun on the hybrids and on the introduced varieties.
Selection on barley is in progress.
Experiments on the inheritance of nicotine content in the tobacco varieties Cabot and Arbi have shown that selection in these lines is useless as the variation is determined entirely by the manuring and the nicotine content can be varied from 1–7·5 by this means.
The department is also occupied with other crops, and with fruits.

1368. Govaert. 575:633(67.5)
L'amélioration des plantes au Congo Belge. (**Plant breeding in the Belgian Congo**).
Rapp. Comm. Sect., Résumés, VIII Congr. Int. Agric. Trop. Subtrop. Rome 1939 : (48) : 63–65.
Oil palm selection has been started. In *Hevea* individual yield records have been made and certain superior clones have been selected for use as mother trees. In cacao the ten best selected trees have yielded from 3·9 to 6·1 kg. of market product per tree. Coffee mother trees yielding over 1·5 kg. per annum have been selected or in the case of Congensis 750 grm. Mean annual yields of up to 7·3 kg. have been recorded. Selection of tea and cinchona is in progress, the quinine content of the cinchona trees varying from 8 to 10 per cent. The new cotton selection 145 C 55 has surpassed the standard in yield by 42·5 per cent and is very popular with the trade.
Breeding work is in progress also with a number of food crops.

1369. Åkerman, Å. 575:633:007(48·5)
Professor H. Nilsson-Ehle och hans insats inom växtförädlingen. (**Professor H. Nilsson-Ehle and his contribution to plant improvement**).
Svenska BryggFören. Månadsbl. 1939 : Häfte 4 : Pp. 5.
A eulogy of Nilsson-Ehle's career and extensive contributions to the development of the

theory and practice of plant breeding, published on the occasion of his resignation from the directorship of the Sveriges Utsädesförening at Svalöf. The foundation and development of two scientific institutes, one for plant breeding and the other for the breeding of forest trees are among the results of his scientific research and the achievements of his mind and personality; and the possibility of even a third being created to deal with fruit tree breeding is mentioned by the author as a further tribute.

1370. Bormans, P. 575:633:575.1
La génétique et l'amélioration des plantes. (**Genetics and plant breeding**).
Vie Agric. Rur. 1939 : **29** : 284–92.
The principles of genetics are briefly expounded and their application to plant-breeding is illustrated.

1371. Frandsen, K. J. 575:633:576.356.5
Polyploidi og planteforaedling I, II. (**Polyploidy and plant breeding I, II**).
Ugeskr. Landm. 1938 : **83** : 787–91, 803–06.
In part I of this article reference is made to a number of autopolyploids produced in crop plants, to the methods of inducing them and to their characteristic features. Part II of the paper contains a concise and documented account of allopolyploidy in interspecific and intergeneric hybridization, illustrated by the classical instances in *Primula*, *Nicotiana* and cereals and by more recent instances in other crops.
The economic value of polyploid forms is pointed out and exemplified with reference to fruits, flowers, vegetables and forest trees.

1372. Siebert, K. 575:633.1(43)
Neue Erkenntnisse auf dem Gebiet der Getreidezüchtung. (**Newly recognized principles in the realm of cereal breeding**).
Forschungsdienst 1938 : **6** : 426–34.
The need for varieties with a wide range of adaptability and also for varieties adapted to the peculiar conditions of certain special areas is emphasized. Varieties of wide adaptability combined with high yield and quality have already been produced in wheat. Further improvements that are now desired are indicated.
It is thought unlikely that it will be possible by breeding to produce barleys with materially higher protein contents; the most likely way of using barley as a source of nitrogen is to grow four and six rowed forms, which have a greater standing capacity under intensive nitrogenous manurial systems. Spring barleys resistant to the existing German races of mildew and brown rust are in course of being bred.
Crosses of wheat with rye are considered to have a distinct future, those with *Agropyron* little or none. Attention is once more called to the importance of land races as breeding material.

GENETICS 575.1

1373. Melchers, G. 575.1:576.12
Genetik und Evolution. (Bericht eines Botanikers). [**Genetics and evolution. (A botanist's report)**].
Z. indukt. Abstamm.- u. VererbLehre 1939 : **76** : 229–59.
The contribution of genetics to evolution is discussed from the point of view of the plant kingdom.

1374. Pedelaborde, J. L. 575.11:578.08:519.24
Método gráfico para el análisis rápido de las distribuciones mendelianas. (**Graphical method for the rapid analysis of Mendelian distributions**).
Rev. Argent. Agron. 1939 : **6** : 35–40.
By plotting the theoretically expected values for mendelian ratios in populations of different sizes together with their probable errors it is possible to determine the significance of any

experimental data by merely noting their position on the graph. The graph indicates which mendelian interpretation best fits the figures and how many individuals are required to solve a case of doubt.

1375. Wettstein, F. von 575.11:581.14
Über verschiedene Fragen der Vererbungsforschung und Entwicklungsphysiologie. (**On various questions of genetics and developmental physiology**).
Biologe 1939 : **8** : 3–9.
The relationships between genes and development are discussed.

1376. Wright, S. 575.113:581.162.5:575.24:519.24
The distribution of self-sterility alleles in populations.
Genetics 1939 : **24** : 538–52.
Formulae are given for the equilibrium values and the rate of change in frequency of allelomorphs causing self-sterility of the *Nicotiana* type. These are expanded to include the effects of mutation and migration. The author then derives the general formula for the distribution of gene frequencies in the population and considers the question of random loss of all allelomorphs and their replacement by mutation. Curves are given relating the maintainable number of allelomorphs to the size of population for given mutation rates. Small populations can maintain a disproportionately high number of allelomorphs as compared with large ones. In applying these results to Emerson's data on *Oenothera organensis*, where already 34 allelomorphs have been found in samples from a total population of probably not more than 500 individuals, it is concluded that this plant must show considerable local inbreeding in order to maintain so many allelomorphs. K. M.

1377. Blaringhem, L. 575.114:575.127.5
Sur l'hérédité unilatérale dans les croisements interspécifiques. (**On unilateral inheritance in interspecific crosses**).
C.R. Acad. Sci. Paris 1939 : **209** : 272–76.
This paper deals with a *Cheiranthus* x *Erysimum* cross, the results of which are held to indicate unilateral inheritance and are also used as the occasion for a similar interpretation of results obtained by the author's collaborator (cf. Abst. 1439).

1378. Anderson, E. 575.116.1:575.114:519.24
The hindrance to gene recombination imposed by linkage: an estimate of its total magnitude.
Amer. Nat. 1939 : **73** : 185–88.
The extremely small chance of obtaining a desired recombination of, say, ten genes in each of ten pairs of chromosomes is shown mathematically.

1379. Brežnev, D. D. 575.12:575.148:635.64
(**The capacity for selective fertilization in tomatoes**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 5 : 14–15.
The variety Stoffert was emasculated and pollinated with a mixture of pollen from the same variety and from another variety, No. 451. All the plants obtained proved to be the result of fertilization by the foreign pollen; when the variety Humbert was pollinated 71·8 per cent of hybrid progeny was obtained, the remaining 28·2 per cent being selfs. The first experiment was repeated in the following year with various modifications. When the emasculated plant was treated with its own pollen, followed in 20 minutes by pollen of another variety, no selfed seedlings resulted, but if instead of its own pollen, pollen from another plant of the same variety was first used, then 22 per cent of maternal type plants were produced. Even when pollen from another plant of the same variety was applied at the same time as or 20 minutes after the pollen of the other variety it effected a certain number of fertilizations.

The author concludes that the egg cell exercises a selection of the pollen grains that are biologically most compatible with it and that in making intravarietal crosses as large a variety of pollen as possible should be used, so as to increase the chances of obtaining the best possible combinations.

1380. 575.127:061.3(47)
(Resolution adopted by the Conference on interspecific and intergeneric hybridization of plants and animals held under the auspices of the U.S.S.R. Academy of Sciences, February 1–4, 1938).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1938 : 983–87.
Reference is made to the numerous interspecific hybrids, especially in plants, that have already proved a success and are being grown on a commercial scale and to others that are considered promising. The most urgent problems awaiting solution by Soviet breeders are enumerated. Breeders are warned against an exaggerated optimism regarding interspecific crossing and against attempting unreasonably wide combinations. The necessity of co-operation between genetics and the cognate sciences is urged.

1381. Georlette, R. 575.127:576.16
Sur la signification des hybrides interspécifiques et intergénériques. **(On the significance of interspecific and intergeneric hybrids).**
Ann. Gembl. 1939 : **45** : 217–23.
Mention is made of a number of the interspecific and intergeneric hybrids obtained by artificial means, and those which occur naturally, and their significance from the point of view of the species problem is briefly discussed.

1382. Harrington, J. B. 575.148:575.42:631.531.12:633
How should varieties of annual self-fertilized crops be perpetuated ?
J. Amer. Soc. Agron. 1939 : **31** : 472–74. (Abst.).
It is pointed out that a variety of such a crop as wheat is not in fact a pure line but a mixture of closely similar forms, probably the descendants of an F_5 or F_6 plant that could not have been truly homozygous. Single plant selection, therefore, will not perpetuate the variety, but will give rise to a population distinctly different from it. The method, coupled with adequate yield tests, should only be used by the plant breeder to improve the variety. Seedsmen concerned merely with keeping stocks of a particular variety should take a random sample from the population, preferably of not less than fifty plants.
The best method is to grow the progenies of these plants separately, eliminate any that obviously deviate from the varietal type, and to bulk the remainder. Absolute genetic purity is of little significance from a practical point of view.

1383. Waddington, C. H. 575.17:576.312.34
The physicochemical nature of the chromosome and the gene.
Amer. Nat. 1939 : **73** : 300–14.
A review of present knowledge of the size and nature of the gene and of its chemical composition.

1384. Brücher, H. 575.182
Die Bedeutung des Zellplasmas für die Vererbung. **(The importance of the cell plasma in inheritance).**
Biologe 1939 : **8** : 160–68.
The results of workers on cytoplasmic inheritance are briefly reviewed and the importance of the findings is discussed.

1385. Reinig, W. F. 575.22:551.56
Die genetisch-chorologischen Grundlagen der gerichteten geographischen Variabilität. (**The genetical-chorographical basis of directional geographical variability**).
Z. indukt. Abstamm.- u. VererbLehre 1939 : **76** : 260–308.
The factors which determine the variability of the characters within a systematic unit, a geographical race or a species in a geographical area are discussed in detail, the examples being taken mainly from the animal kingdom.

1386. Kerkis, Ju. Ja. 575.24
(**Is the spontaneous mutation process identical to that induced by X-rays ?**)
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1938 : 1037–50.
Attempts to discover any directional influence of X-rays and other agencies on the mutation process have failed, all mutations so far observed being entirely at random, apart from the apparently greater frequency of recessive as compared with dominant mutants. Modern data are cited in support of the view that the random character of artificial mutations results from the nature of the gene and of the mutation process and is equally characteristic of natural mutations.
Adaptations, mimicry and allied phenomena are explained by natural selection and homologous series of mutants in related genera are interpreted as the result of common ancestry, except in the case of false homologies conditioned by entirely independent genes. The frequency with which similar characters are conditioned by dissimilar genes is held to be a strong argument for the role of selection rather than directional mutation as an evolutionary factor.
In both artificial and natural mutation the lethal mutants are much more frequent than the visible mutants, which is to be expected in view of the extreme adaptation of modern organisms. Certain facts are quoted, however, which indicate that the proportion of lethals is different when different agencies are used; this may be connected with the fact that certain agencies, in particular X-rays, produce a large proportion of chromosomal aberrations, whereas spontaneous lethal mutants are nearly all point mutations; certain agencies, such as ultra-violet rays and certain chemicals also produce a very low proportion of chromosomal alterations.
The difference in type of X-ray and spontaneous mutants is not thought to militate against the value of X-rays as an agent for producing artificial mutations.

1387. Stubbe, H. 575.243:581.02
Aenderungen des Erbgutes durch physiologische Einflüsse. (**Alterations of the genotype by physiological influences**).
Umschau 1939 : **43** : 391–94.
Attention is called to the role of factors such as temperature and aging, which may readily be operative under natural conditions, in producing mutations. Recent experiments have shown that nutritional deficiencies also increase the mutation rate, though only when this takes the form of a greater deficiency in certain elements than of others, the cause being evidently a disturbance of the balance of metabolism.

1388. 575.4:575.1(47)
576.16
Vavilov, N. I.
(**Reply to the article by G. N. Shlykov "Formal genetics and consistent Darwinism"**).
Soviet Subtropics 1939 : No. 6 (58) : 54–56.

Shlykov, G.
(**In the fetters of false science**).
Ibid. 1939 : No. 6 (58) : 57–61.
In replying to the criticisms of Shlykov in an earlier number of the journal (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 649) the author gives once more an outline of the principle of gene

centres. Shlykov subjects the reply to further criticism, maintaining that nothing of any practical value has yet been obtained from the gene centres and that Vavilov's principles are fascistic.

ORIGIN OF SPECIES, ETC. 576.1

1389. 576.12:575.22
Parallelbildung und Stammesgeschichte. (**Parallel trends and phylogeny**).
Biologe 1939 : **8** : 44–48.
A simple exposition of some of the evidence that mutation does not occur in all directions with random frequency, but tends to follow certain definite trends, which may be the same in different species of organisms.

1390. Rahn, O. 576.12:575.242:581.02
Building stones to a chemistry of evolution.
Amer. Nat. 1939 : **73** : 26–43.
The author regards evolution principally as the formation of new genes and postulates that the rate of such evolution should follow chemical laws. The mutation frequency in a species should vary with the number of individuals of that species born each year, with the temperature of the environment (except in the case of mammals and birds with constant blood temperature) and with the amount of change occurring in the environment. Evidence in support of these contentions is presented, this evidence conflicting with the theory that mutation is principally caused by cosmic rays or other radiation.
Polyploid plants form an exception to the above laws: they are commonest in sub-polar regions.

1391. Miller, H. 576.12:582
The genus and species in relation to evolution and to system.
Amer. Nat. 1939 : **73** : 93–95.
A discussion of the way in which studies of evolution have shown the sharp discontinuities and fixed classes of the older systems of classification to be invalid.

CYTOLOGY 576.3

1392. Yamaha, G. and
Ueda, R. 576.312:534.39:635.651
Über den Einfluss der Ultraschallwellen auf die Wurzelspitzenzellen von *Vicia Faba* L.—Ein Orientierungsversuch. (**On the influence of supersonic sound waves on the root tip cells of *V. Faba* L.—A preliminary experiment**).
Cytologia, Tokyo 1939 : **9** : 524–32.
Root tips of *V. Faba* were subjected to waves of 450 kilocycles frequency for periods of five and ten minutes, after which they were fixed either immediately or at the end of 24 hours. Very marked disturbances were noted in all cases, the most striking effects being (1) plasmolysis and vacuolization of the cytoplasm, (2) fragmentation of chromosomes, (3) the occurrence of multipolar spindles, (4) the clumping of the chromosomes into more or less homogeneous masses and (5) homogenization of the cytoplasm and spindle, with subsequent failure to form cross walls.

1393. Guilliermond, A. and 576.312.3:633.11
Gautheret, R. 576.312.3:635.15
Contribution à l'étude de la structure du noyau dans les cellules végétales: noyaux à réticulum chromatique et noyaux à prochromosomes. (**Contribution to the study of the structure of the nucleus in plant cells: nuclei with a chromatic reticulum and nuclei with prochromosomes**).
Rev. Cytol. Cytophysiol. Vég. (1937) : 1938 : **2** : 354–75.
A comparative study was made of the resting nuclei of wheat and *Raphanus sativus*, both *in vivo* and after fixation. The nuclei of wheat appeared to be granular, the granules under

more critical observations appearing to be the junctions in a fine peripheral reticulum. *Raphanus* nuclei did not possess a reticulum, but a clear, optically homogeneous karyolymph containing, besides the nucleolus, a number of prochromosomes which corresponds exactly with the somatic chromosome number. The transition of these prochromosomes to chromosomes and their re-formation after mitosis are described. It is concluded that they represent the median portions of chromosomes.

1394. Bauer, H. 576.312:575.242
Die Chromosomenmutationen. (**Chromosome mutations**).
Z. indukt. Abstamm.-u. VererbLehre 1939 : **76** : 309–22.
After descriptions of the kinds of chromosome mutations and their origin, the relation between gene and chromosome mutations is discussed.

1395. Kerkis, J. 576.312.341
On the nature of the so-called inert regions of the chromosomes in relation to the problem of the chromosome structure.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **22** : 606–08.
The author is of the opinion that there is no essential difference between "inert" and "active" regions of chromosomes, the inert regions in such an organism as *Drosophila* being merely those in which the chromatin bands are very far apart or too small to be visible. He is in accord with the views of Goldschmidt and others that the axis of the chromonema consists of polypeptide links in a giant protein molecule, with the genes present in the form of side chains.

1396. Demerec, M. 576.312.341:575.17
Chromosome structure as viewed by a geneticist.
Amer. Nat. 1939 : **73** : 331–38.
The chromosome is represented as consisting, both in active and heterochromatic regions, of a fibre-like chromonema with the genes present as side chains. The action of a gene is determined by its own chemical composition, by the constitution of the genotype in which it acts and by its position in the chromosome relative to other genes.

1397. Sax, K. 576.312.36:537.531
The time factor in X-ray production of chromosome aberrations.
Proc. Nat. Acad. Sci. Wash. 1939 : **25** : 225–33.
A given dosage of X-rays of high intensity is more effective than the same dosage at a lower intensity in producing the types of chromosome break in *Tradescantia* microspores that are dependent upon two distinct X-ray "hits". Similarly, with a given intensity and total dosage, continuous irradiation is more effective than intermittent. The types of break dependent upon a single hit are not affected by this time-intensity factor. The results obtained are interpreted as follows: in cases where a break is dependent upon two separate hits, these must occur close together in time and space. Low intensity irradiation produces breaks which may "heal" before a second break occurs in the vicinity, i.e. the broken ends may re-unite and no chromosome aberration is produced. In *Tradescantia*, broken ends of chromosomes may remain in an unstable condition and capable of fusion for a maximum period of about an hour.

1398. Müntzing, A. 576.312.36:575.1
Chromosomenaberrationen bei Pflanzen und ihre genetische Wirkung. (**Chromosome aberrations in plants and their genetical effect**).
Z. indukt. Abstamm.- u. VererbLehre 1939 : **76** : 323–51.
In this lecture the findings of H. Bauer (Cf. Abst. 1394) are elaborated from the point of view of chromosome aberrations in plants.
The aberrations include: fragmentation, fusion, translocation, inversion, deletion or deficiency and duplication. The effects of such aberrations leading to structural heterozygosity in species hybrids and intraspecific hybrids are discussed. The effects of chromosome aberrations are also reviewed in relation to inbreeding phenomena and to the origin of aberrations. Mention is also made of the relation between chromosome aberration and gene mutation.

1399. Catcheside, D. G. 576.312.381
The centromere.
Chronica Botanica 1939 : **5** : 160–61.
A description of the functions and behaviour, normal and abnormal, of the centromere.

1400. Nebel, B. R. 576.312.381:576.312.341
On coiling in chromosomes.
Amer. Nat. 1939 : **73** : 289–99.
It is suggested that the chromonema consists of flat rectangular platelets and the phenomena of spiralization are interpreted on this basis.

1401. Courtine, J. 576.312.6
La nature de la cytomyxie. (**The nature of cytomixis**).
C.R. Acad. Sci. Paris 1939 : **209** : 234–36.
A note on the phenomenon termed cytomixis by R. R. Gates. The writer's observations on *Triticum vulgare, T. durum, T. monococcum, T. dicoccum* and their hybrids with *Aegilops ovata* lead him to conclude that it is a traumatic effect which is due to microscopic technique and may be induced at will by moderate pressure on the anther or other artificial means.

1402. 576.353:581.04:635.25
Shimamura, T. 635.64:576.356.5:581.04
Cytological studies on polyploidy induced by colchicine.
Cytologia, Tokyo 1939 : **9** : 486–94.
The course of mitosis in root tip cells of *Allium Cepa* treated with colchicine is described. By treatment with lanolin pastes containing colchicine, tetraploid plants of *Lycopersicon esculentum* and *L. pimpinellifolium* were obtained in addition to "mixoploid" chimaeras. The *L. pimpinellifolium* tetraploids, unlike those of *L. esculentum,* were self-fertile.

1403. Breslavets, L. P. 576.356.5
(**Polyploidy and its significance in the origin of forms and in breeding**).
Trav. Jard. Bot. Univ. Moscow 1938 : **2** : 5–16.
The existing information on the phenomenon of polyploidy is outlined in some detail. Special attention is given to the physiological and chemical differences between polyploids and their diploid relatives. The practical importance of polyploidy is illustrated by the fact that the original diploids have been replaced by tetraploids and higher polyploids in many ornamental and crop plants, and the discovery of the colchicine method should make it possible to make a much fuller use of the possibilities of polyploidy in plant breeding.

1404. Levitski, G. A. 576.356.5:576.12
(**Cytological foundations of evolution**).
Priroda (Nature) 1939 : No. 5 : 33–44.
The author refers to the connexion that has been observed between polyploidy and rigorous conditions of growth, to the greater variability of polyploids, and the existence of a sterility barrier between polyploids and the related diploids; also to the greater tendency to the formation of polyploids observed in some races of plants than in others; and to the frequency in nature of amphidiploid species and the complications that these bring into the physiological and phylogenetical relationships between species.
The role of structural chromosome changes in evolution is emphasized and unpublished work of Joffe is quoted, showing that in cross-fertilized plants such as sunflower structural changes are particularly frequent, differences having been observed between different races and even individuals of the same race. Forms with a new basic chromosome number, of more evolutionary importance than polyploids, can arise by means of structural changes. Many of the variations originally thought to be gene mutations have been later shown to be structural changes and the concept of the gene as a distinct entity is losing its force, the chromosome being more and more regarded as an entity, consisting of one enormous molecule, any change in the organization of which is reflected in the phenotype.

There is also discernible a clear tendency for the more advanced members of an evolutionary series to contain less chromatin material, as a result of a reduction either in size or number of chromosomes.
The role of the plasma in evolution is regarded as still undemonstrated.

1405. Schmuck, A. 576.356.5:581.04
(Concerning the effect of chemical substances on the change in hereditary properties of plants).
Priroda (Nature) 1939 : No. 3 : 74–78.
The similarity of action of such structurally different compounds as colchicine and acenaphthene leads the author to consider that their action is not direct but through the formation under their influence of some other compound within the cell. The action of a great variety of other compounds has been tested and none was found to have any effect upon cell behaviour such as that exerted by colchicine and acenaphthene. Even slight changes in the structure of these compounds destroy their characteristic action.

1406. Shmuck, A. and Kostoff, D. 576.356.5:581.04
Brome-acenaphthene and brome-naphthaline as agents inducing chromosome doubling in rye and wheat.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 263–66.
The preparations of 5-brom-acenaphthene and α-brom-naphthaline are briefly described and their effect upon germinating wheat and rye seeds discussed. Brom-acenaphthene is more potent than brom-naphthaline in the production of chromosome abnormalities.
Seeds of *Triticum vulgare* and *Secale cereale* when germinated in Petri dishes together with 3 mg. brom-acenaphthene for four days produced frequent tetraploid and octoploid cells in the root tips. *Vicia sativa* and *Crepis capillaris* failed to react to similar treatment.
J. Wilson.

1407. Kostoff, D. and Chevalier, A. 576.356.5:581.04:633
Production de plantes à caractères nouveaux par le doublement du nombre des chromosomes (polyploïdie). [**Production of plants with new characters by the doubling of the number of chromosomes (polyploidy)**].
Rev. Bot. Appl. 1939 : **19** : 81–88.
The character changes usually associated with a doubling of the chromosome number are listed and the methods of using colchicine and acenaphthene for the induction of polyploidy summarized. It is pointed out that different groups of plants or even different species within a genus may differ markedly in the ease with which they react to treatment with these substances; it is stated that cereals respond most readily, composites are intermediate and legumes are least sensitive.
In an introductory section Chevalier refers, *inter alia*, to the work of Simonet, who has succeeded in inducing polyploidy in *Petunia*, flax and radishes.

1408. Shmuck, A. and Gusseva, A. 576.356.5:581.04:633.11
Active concentrations of acenaphthene inducing alterations in the processes of cell division in plants.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **22** : 441–43.
Tests with purified samples of acenaphthene showed that the substance itself, and not any impurities contained in commercial samples, is responsible for the biological effects previously observed (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1386 and later abstracts). It was determined that a dosage of less than 7 micrograms of acenaphthene per grain was sufficient to produce a strong effect on wheat grains germinating in Petri dishes.

1409. Fukushima, E. 576.356.5:581.04:633.42
Acenaphthene as a polyploidizing agent.
Proc. Imp. Acad., Japan 1939 : **15** : 98–100.
By treating young inflorescences of *Brassica alboglabra* ($2n = 18$) with acenaphthene various anomalies of division were induced, and haploid, diploid, tetraploid, and octoploid pollen was formed.

1410. 576.356.5:581.04:633.71
Kostoff, D. 576.356.5:581.04:635.52
(Polyploids obtained by treating germinating seeds).
Priroda (Nature) 1939 : No. 2 : 103–04.
By treating germinating seeds with 0·5–0·05 per cent solutions of colchicine tetraploid seedlings were obtained in the following species: *Nicotiana rustica, N. Sanderae, N. Tabacum, N. glauca,* and the F_1 hybrids *N. alata* x *N. Sanderae, N. suaveolens* x *N. alata, N. excelsior* x *N. velutina* and others. An octoploid was also obtained in the hybrid *N. alata* x *N. Sanderae.* In those hybrids which were sterile, chromosome duplication caused them to be fertile.
A tetraploid plant of *Lactuca sativa* was observed among seedlings from seeds treated with acenaphthene; it flowered ten days later than the diploids, a feature which is of distinct agricultural advantage.
Acenaphthene treatment led also to the production of tetraploid and octoploid seedlings of *N. longiflora.*
All the polyloids referred to have proved later in maturity, and have had larger and thicker leaves, larger stomatal guard cells, flower buds, pollen cells, ovules, seeds and hairs and were darker green and coarser in habit. The corolla tubes were thicker, sometimes longer and sometimes shorter than the diploids.
The meiotic irre gularities, multivalent formation and sterility were less pronounced in these polyploids than in polyploids of species with a smaller number of chromosomes of larger dimensions.

1411. Simonet, M. and
Chopinet, R. 576.356.5:581.04:633.853.49
Apparition de mutations géantes et polyploides chez le colza, la pervenche et le lin à grande fleur, après application de colchicine. (**Occurrence of giant mutants and polyploids in colza, periwinkle and flowering flax, after colchicine treatment**).
C.R. Acad Sci. Paris 1939 : **209** : 238–40.
Continuing their previous studies the authors record cases of gigantism and tetraploidy accompanied by meiotic irregularities in *Brassica campestris* L. and *Linum grandiflorum* Desf. var. *rubrum* Hort. (cf. also "Plant Breeding Abstracts", Vol. IX, Abst. 330).

BOTANY 58.

1412. Wong, Cheong-Yin 581.163:577.17
Induced parthenocarpy of watermelon, cucumber and pepper by the use of growth promoting substances.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 632–36.
The production is reported of parthenocarpic fruits in water-melon, cucumber and pepper by treatment of the stigma or cut style with naphthalene-acetic acid in one to five per cent lanolin paste or 0·05 per cent aqueous solution. J. L. F.

1413. Brand, D. D. 581.9:633
The origin and early distribution of New World cultivated plants.
Agric. Hist. 1939 : **13** : 109–17.
The various methods that have been employed to determine the origin of crop plants are discussed; these include the botanical method of Vavilov and the archaeological, historical, philological and mythological approaches. In the second part of the paper a list is given of the

crop plants native to the New World, with particulars as to their regions of origin. No species of crop plant was common to both the Old and New Worlds in pre-Columbian time except *Lagenaria vulgaris* and *Cocos nucifera*. Both of these plants are capable of being carried long distances by ocean currents. There are, of course, many cases in which different species of the same genus were cultivated in the Old World and in America.

1414. 589.77:575:633.9(43)
Ullrich, H. 589.77:575.127.2
Möglichkeiten der Weberkardenzüchtung. (**Possibilities of breeding teasels**).
Züchter 1939 : **11** : 44–47.

For the type of machine where the entire teasel head is employed a roundish head with strong rachis is required, for the machines where the head is cut into cross sections a cylindrical head of the greatest possible length is desired. These two types can be produced by selection.
Seed material was obtained from a variety of sources. The quality of the heads from a number of plants was tested, one head on each tested plant being bagged for seed production. Great variation was observed in type and in suitability for textile purposes; types suitable for different processes were found, e.g. varying in stiffness, elasticity and other features, and it is hoped to fix these by selection. A number of plants appeared to be hybrids between *Dipsacus sativus* and *D. sylvestris* and even *D. pilosus* or *D. laciniatus*. The hybrids with *D. sylvestris* have particularly long and pliable bristles, and are very suitable for work with fine fibres.

AGRICULTURE 63

1415. Coolhaas, C. 63.0015(92.2)
Proeftuinen, proefvelden en proefveldendienst in de organisatie der Proefstations. (**Experimental plantations, test plots and the test plot service in the organization of the Experiment Stations**).
Bergcultures 1939 : **13** : 720–25.

A statement of the author's views on the proper functions and importance of the field trial, the experimental plantation [proeftuin] and the planters' estates in research on perennial crops. Some points in a previous article (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 149) are elaborated.
Uniformity in methods of crop testing is regarded as a highly desirable aim which might some day be realised throughout Java, and in southern and western Sumatra.

PLANT DISEASES AND PESTS 632

1416. Chiarugi, A. 632:575
L'eredità in patologia vegetale. (**Heredity in plant pathology**).
Relaz. IV Congr. Int. Patol. Comp. Roma 1939 : **1** : 155–210.

The author discusses the genetical aspects of pathology. Genetical factors may have a direct pathological effect or their action may be indirect, that is, they may simply cause a greater susceptibility to external pathological agents. Direct pathological effects may be caused by a genotype change in a part of the organism during the development of the soma or may arise through a change of the genom, the chromosome or of the genes.
The indirect genetical cause of susceptibility to disease both in the host and in the parasite are discussed and the possibilities of creating resistant varieties are considered. The hybridization of cultivated varieties with wild races from the gene centres is advocated.

1417. Köck, G. 632–1.521.6:633:575
Die Entwicklung und der gegenwärtige Stand der Immunitätszüchtung. (**The development and the present position of breeding for immunity**).
Wien. landw. Ztg. 1938 : **88** : 403–04, 412–13.

Various obstacles that stand in the way of the production of resistant crop plants by breeding and certain positive achievements in the form of varieties combining resistance with good commercial qualities are mentioned, special emphasis being laid on the importance of physiological forms of the pathogen in nearly every case. The author concludes that we are still only at the beginning of what may ultimately be achieved in this field.

1418. Schiemann, E. 632.4–1.521.6:633:575
Ueber die Züchtung resistenter Rassen der Kulturpflanzen. (**On the breeding of resistant races of cultivated plants**).
Chronica Botanica 1939 : **5** : 161–64.
In this brief review the following topics, among others, are discussed: the development of methods of artificial mass infection of seedlings under controlled conditions; the discovery of physiological races of fungi; work on the physiology of resistance, and the collection of resistant wild types from the centres of origin of crop plants.

1419. Renaud, J. 632.422.3:575.243:581.04
Sur la stabilité des races de levures de vin. (**On the stability of races of wine yeasts**).
C.R. Soc. Biol. Paris 1939 : **131** : 681–82.
After the work of Hansen, Winge and Laustsen (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 430), Kondriatiev and Saenko on variation, mutation and heterozygosity in yeasts has been reviewed the author describes his own experiments with *Saccharomyces ellipsoideus* cultures under the action of various concentrations of calcium chloride.
He concludes that when the agent producing variation is relatively weak the hereditary characteristics of the races remain stable.

1420. Gonzalez Toriño, H. 632.422.3:575.42:634.8
Selección de levaduras vínicas puras especializadas en la producción de altas graduaciones alcohólicas. (**Selection of pure wine yeasts specialized in the production of high degrees of alcohol**).
Rev. Fac. Agron., Univ. Montevideo 1939 : No. 17 : 57–145.
The various types of yeasts and their action are described and the advantages of using pure races are enumerated. Details are then given of the methods of selecting pure strains and of experiments carried out to produce such strains. Two distinct races were selected, differing in the amount of froth they produced, in rate of clarification, consistency of deposit and in spore form and size, rate of budding, and form of colony in gelatine medium. Both proved more effective than unselected yeasts, leaving less unfermented sugar, the one race producing much less volatile acid than the other and being accounted the better of the two; it gives exceptionally good results when used with sulphites and phosphates together, even in concentrated musts to which sucrose has been added. Using this race degrees of alcohol of 16 and over have been obtained, in wines of excellent bouquet and good clarification, with low acidity and consequent high keeping capacity.

1421. Dahms, R. G. and
Fenton, F. A. 632.7:633–1.521.6:575
Plant breeding and selecting for insect resistance.
J. Econ. Ent. 1939 : **32** : 131–34.
Breeding resistant varieties of crop plants is the most practicable method of controlling some insect pests. For the best results the problem requires the co-operation of the entomologist and plant breeder. Heavy uniform infestation by the insect is desirable when selecting, but often difficult to secure. In many cases insect resistance is known to be a heritable character. Resistant forms may often be obtained by direct selection but these are rarely desirable agronomically and crossing with susceptible but otherwise desirable varieties is necessary. It is possible that certain insects exist in distinct physiological strains. The causes of insect resistance are complex and little understood.

1422. Kausche, G. A. and
Stubbe, H. 632.8:633.71:575.243:537.531
Über die Entstehung einer mit Röntgenstrahlen induzierten "Mutation" des Tabakmosaikvirus. (**On the occurrence of a tobacco mosaic virus mutation induced by X-rays**).
Naturwissenschaften 1939 : **27** : 501–02.
Allowing for possible sources of error, the authors' results from irradiation of tobacco mosaic

virus would appear to indicate that X-ray irradiation has induced a stable qualitative change in a small number of the protein molecules. The effects of this change, which is being further investigated from the physico-chemical standpoint, are clearly shown in the leaf symptoms produced by the virus before and after irradiation.

ECONOMIC PLANTS 633

1423. SCHIEMANN, E. 633:576.16:575.22
Gedanken zur Gencentrentheorie Vavilovs. (**Views on Vavilov's gene centre theory**).
Naturwissenschaften 1939 : **27** : 377–83, 394–401.

Having outlined the development and substance of Vavilov's theory of the origin of cultivated plants and its application to cereals, his views on variation and its causes and the gene centre theory are presented with some observations on the relation between wild and cultivated forms. Incidentally valuable tabulated data are given on the various expeditions made by Vavilov and others to investigate the origin of crop plants.

Critical examination shows Vavilov's gene centre theory to have been a contribution of enormous importance to plant breeding and phylogenetic studies. In the writer's opinion, however, the identification of the gene centre of the individual crops with their centre of origin is not valid for all cases; for many centres of variability may well be secondary centres of development. The writer claims to have demonstrated this for wheat and barley and has further supported her argument with instances taken from the phylogenetic history of plants other than crops.

A bibliography is appended.

1424. COOLHAAS, C. 633.0015(92.2)
Een overzicht van de werkzaamheden van het Proefstation M.O.J. in 1938. (**A survey of the activities of the Central and East Java Experiment Station in 1938**).
Bergcultures 1939 : **13** : 556–66.

The Cytological Division of the station is studying the whole process of fertilization in coffee and especially with reference to defects such as round or spongy beans. Round beans are caused by incomplete pollination or, in hybrids (e.g. Conuga), by failure of one of the seeds to develop. In the latter case selection is the only remedy; and the number of round beans produced in different Conuga clones is being studied. Data on spongy bean production in the Kawisari hybrids indicated that defective fruit setting was correlated with too small a number of chromosomes and pollination with forms such as Arabica types, with a high chromosome number, is therefore suggested.

Arabica-, Robusta- and Arabica-Congensis crosses are being investigated. Arabica-Congensis hybrids with 33 chromosomes are sterile, but some 44 chromosome hybrids which are superior in flowering and in set of berries have arisen by doubling of the 11 Robusta chromosomes. In future selection the 33 chromosome forms are to be eliminated by root examinations at the seedling stage.

Selection of mother trees from controlled pollinations has shown the crosses with SA 34 to contain some remarkably good specimens.

Work has also been done on hybridization to combine high yield with desirable characters for grafting purposes (fan-shaped branch formation), clone TP 21 being frequently used as one of the parents.

Seed from the Congo, Kenya and Tanganyika has been imported in hopes of introducing certain characters lacking in the original importations of Robusta.

Estimations of the quality of various clones and the effect of the mode of preparation upon it are in progress.

Tests for resistance to eel worm (*Tylenchus coffeae*) are being conducted with cuttings from promising trees. In comparative studies SA 34 and SA 13 showed a low percentage of infestation by coffee berry borer, and SA 13 also a low percentage of round beans. Data on bean size in the various clones were also collected and on the performance of various clones and of

seedlings from controlled pollinations. The testing of a number of new hybrids was also begun.
The statistical study of flowering was continued and it was found that on estates where humidity is high, the early blooming period gave a relatively better set of flowers than the more extensive later one—a point which should be considered in selection.
Rubber improvement was continued, using artificial pollination. Hybridization experiments are also in progress and observations were collected on test plantations of clones, on the increase in circumference of the stem, rate of growth, yields and influence of the stock on the scion, etc.
The investigations on cacao are being directed towards a study of the genetical basis of cotyledon colour both as regards intensity and distribution (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 396).
Tests of Assinan-Angoleta clones have shown As 3 and As 8 to be the most promising; but as the Assinan-Angoleta type as a whole is weak further comparison with Djatiroenggo clones is desirable. The relation of seed colour to growth vigour is also under observation.
Research on *Helopeltis* damage of cacao suggests the possibility that a certain degree of immunity found in some trees may be due to their inherent characteristics as well as other factors and selection might therefore be an effective factor in reducing attack.
The paper was followed by an active discussion.

CEREALS 633.1

1425. VOLKART, A. 633.1:575
Getreidezucht. (**Cereal breeding**).
Schweiz. landw. Mh. 1939 : No. 5 : 144–47.
A brief and general account of the methods of cereal breeding in which wheat and rye are taken as examples.

WHEAT 633.11

1426. 633.11(43.8)
GIŻBERTÓWNA, W. 633.11:575(43.8)
Polskie odmiany Pszenicy. (**Classification of common bread wheat varieties, cultivated in Poland**).
Prace Rolniczo-Leśne, Kraków 1938 : No. 28 : Pp. 172.
The history of wheat cultivation in Poland is outlined. One of the oldest varieties is Sandomierka, characterized by high grain quality and low cultural demands; it has actually never been a true variety but a mixture of forms, which accounts for the frequent reference to its supposed "degeneration". Other ancient varieties are Kujawska Biała and Płocka; the former was produced by the Danzig peasants who saved always the earliest maturing grain for seed and so produced an early, high yielding white variety, which has been known also as Gdańska. Płocka was an equally successful variety and these three local forms have served as the main parents in later breeding work. Thus Płocka has given rise by selection to the variety Sarnowska, with good vitreous grain. Then there appeared Puławka, another awnless wheat produced in 1867 by selection from a Russian winter form, which has also played a great part as a parent in later breeding work. In 1880 the work of K. Bielawski began to take effect with the production of the wheats Genealogiczna Biała, Genealogiczna Czerwona and Wysokolitewka, the last named having long remained one of the highest yielding of all varieties.
Aleksander Janasz at Dańkow produced Dańkowska Selekcyjna by continued selection in the progeny of a single plant found in a field of Puławka; also New Jersey (syn. Epp-Weizen, Epka), which however proved unsuitable for the Baltic coastal regions.
In 1892 a breeding station was founded in Podlasie and in 1899 a second in Płotsk. In the former under Sempołowski individual plant selection was carried out on the varieties Płocka, Modliborczycka and Wysokolitewka; also on land races such as Żmudka, a population of forms of the Milturum type, with lax ears and uniform vitreous grain, which has often been used as a parent in later breeding work.

The early recognition of the value of the local strains saved Poland from the losses suffered by other countries of North West Europe from the introduction of foreign varieties that later proved unsuitable to local conditions. These Polish varieties were in later years crossed with foreign varieties, e.g. Płocka with Frankenstein, Puławka with Hanna, Sandomierka with Michigan, etc. K. Rogoyski produced a series of lines of Sandomierka from aberrant forms, supposedly due to ear mutations, found in that variety.

Awnless varieties were originally valued much more than awned but it was found that they were incapable of supplying the types required by the whole of the extensive territory of Poland, especially the large south-eastern tracts with extreme annual variations of temperature. For these latter areas awned wheats proved more suitable, especially the German variety Tryumph Podola with fine vitreous grain, said to have arisen from a single ear of a local strain of awned red wheat which was probably a natural hybrid of that wheat with Banatka Czerwona (Red Banatka). In the period 1880–90 the first steps in the breeding of the awned wheat Ostka Galicyjska were taken. This wheat arose by selection from a Rumanian wheat. Two selections of it, very similar in morphological characters, were produced, one by Stan. Żeleński in 1880, the other by J. Turnau in 1895. The awned varieties Ostka Grodkowicka and Ostka Mikulicka which closely resembles it, are still popular, especially for variable conditions of growth. Ostka Galicyjska was also subjected to selection by the potato breeder H. Dołkowski, who produced a type with a long and compact ear.

In the following years further progress was sought in the introduction of new varieties from abroad, mainly of the Squarehead type, leading to a series of disappointments, only terminated by the work of Aleksander Janasz, who in the production of the wheat Graniatka Dańkowska showed a remarkably clear feeling for the laws of heredity before the publication of the Mendelian laws. Janasz produced a number of varieties combining the Squarehead type of ear with the tolerance of northern conditions and the high grain quality of the local wheats. Graniatka Dańkowska was produced by crossing Dańkowska sztywnosłoma (Dańkow Stiff-strawed) = Squarehead x Puławka with Dańkowska Selekcyjna.

The value of the local wheats of Małopolska was appreciated by Professor K. Miczyński, e.g. their adaptation to local conditions and high quality grain, but he realized also their defects, such as a tendency to lodge under intensive conditions of cultivation and often also susceptibility to fungous diseases. By crossing Ostka Galicyjska with Squarehead he obtained forms with denser ears, stronger straw and suitable for the conditions of eastern Małopolska; the best of these were Złotka and Hanka. He also made some of the first interspecific crosses (*T. compactum* Host. var. *creticum*, Blé carré de Sicile x *T. vulgare* var. *lutescens*, Jara Gołka Galicyjska) and was quick to apply the Mendelian laws after their rediscovery in 1900.

From that time on the number of varieties increased enormously and the task of tracing their genealogy is exceedingly difficult. Many of them are inferior or synonyms and the present work is an attempt at classification of the main existing Polish varieties together with eight of the chief foreign varieties. The classification is based on characters of the grain, growing plant and mature plant; the characters used are described and illustrated, a key for the identification of the varieties is given, with an alphabetical list of the varieties and description and illustrations of each. The monograph terminates with a bibliography of 139 references.

1427. Ciferri, R. 633.11(63)
Frumenti e granicoltura indigena in Etiopia. **(Native wheats and wheat cultivation in Abyssinia).**
Atti R. Accad. Georgofili, Firenze 1939 : Pp. 12.

The study of the wheats collected in Italian East Africa has revealed the presence of as many as 7 species, 4 endemic subspecies, 9 sections, 8 subsections, 293 botanical varieties and over 800 sub-varieties. Over 70 per cent of the varieties are endemic and in the case of *Triticum durum* 90 per cent. Many of the characters are unknown elsewhere and a great number of natural hybrids occur, including many hybrids between *T. durum* and *T. turgidum*. Certain characters such as early maturity and awnlessness are already being utilized in practical breeding work.

In view of the presence of a certain number of endemic hexaploid wheats too, Abyssinia is regarded as a secondary centre also for this group.
Various practical advantages of the extreme heterogeneity of the sowings are pointed out and caution in introducing high-bred varieties from Europe or in practising a too rigid selection of the local strains is counselled. A system of selection consisting merely in removing the very worst types from the mixture is recommended.

1428. Ciferri, R. and Giglioli, G. R. 633.11(63)
I cereali dell'Africa Italiana. I. I frumenti dell'Africa Orientale Italiana studiati su materiali originali. (**The cereals of Italian Africa. I. The wheats of Italian East Africa studied on original material**).
Bibl. Agrar. Colon., Firenze 1939 : Pp. 298.
After a brief review of the literature on the subject the present system of classification of wheat is discussed in some detail. The general characteristics of the Abyssinian wheats are then described. Full descriptions are given of the forms occurring in the extensive collection of wheats from Italian East Africa made after the conquest of Abyssinia. A list of the forms occurring is given, together with data on their geographical distribution and illustrations of a number of the types.
The existence of a large series of awnless forms of *Triticum durum* is thought to be important from the breeding point of view, not only for breeding *T. durum* but for crossing with *T. vulgare*, the presence of awns in the segregates of such crosses having caused considerable difficulties in the past.

1429. Kalinin, P. K. 633.11:575(47)
(**Breeding wheat at Khibiny**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 2–3 : 26–28.
An outline is given of wheat breeding at the Khibiny Station in which the theories of phasic development, the value of intra-varietal hybridization, variation induced by environment, and the effect of the locality in which the seed has been produced upon the resulting plants have played their part.
The possibility of wheat cultivation in the extreme north without the importation of seed from southern regions has been demonstrated. The winter wheat Kooperatorka has, under suitable experimental conditions, been converted into a spring form requiring a high temperature at the vernalization stage.
Though no actual experiments were made, observations showed that many wheats, grown year after year from seed raised at Khibiny under long day and low temperatures, gradually came to ripen earlier.
Selection is proceeding and 3,000 of the best lines have been chosen for the 1939 nursery.

1430. Luk'janenko, P. P. 633.11:575(47)
(**Production of a new variety of winter wheat in Kuban "Novo-Ukrainka No. 83"**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 5 : 7–10.
The F_1 of the cross Ukrainka (winter) x Marquis (spring) was a spring wheat in habit and segregation occurred in the following generations. Data are given for the winter-hardiness of the different groups of segregates; quite two-thirds of the F_3 segregates were non-hardy spring forms. The winter group contained a higher proportion of hardy segregates and some were highly frost-resistant and occasionally exceeded the more resistant winter parent.
Several hybrids displayed immunity to brown rust; some of them surpassed the Marquis parent, and were at the same time resistant to stem rust, a quality absent in both parents. In yield the hybrids are much in advance of Ukrainka; one, named Novo-Ukrainka No. 83, has exceeded Ukrainka by 35 per cent over a three-year period and has outclassed even the local standards Stavropolka and Krasnodarka. It took first place also in quality and in

thousand corn weight. The new variety is also distinguished by strong straw and freedom from shedding.
An awnless hybrid Lutescens H–82 from the same cross comes next in yielding capacity and on account of its awnlessness further work on it is being continued.

1431. Povolotskii, P. K. 633.11:575(47)
(A new variety of winter wheat).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 2–3 : 25–26.
The new variety, which is called "Improved Kanred x Fulcaster", is a selection from the hybrid Kanred x Fulcaster. As compared with the parent the new wheat is high yielding, resistant to lodging, smut and Hessian fly attack and is more uniform morphologically. By further improvement it is hoped that with frost and drought resistance as additional characteristics the new hybrid may replace Ukrainka.

1432. Sologub, S. D. 633.11:575(47)
(Promising varieties of spring wheat).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 5 : 33–34.
Among the new varieties produced at the Šatilovo plant breeding station two hybrid varieties are referred to, Milturum 50-h-21 and Ferrugineum 19-h-1, which have exceeded Lutescens 062 in yield, in some years by 5-7 per cent. They are more resistant to frit fly.
Lutescens 1117/32, a selection from a Chinese wheat, is resistant to yellow rust and smut and has outyielded Lutescens 062 by as much as 15·5 per cent.

1433. Åkerman, Å. 633.11:575(48·5)
Svalöfs Skandiahöstvete II. (01090 b_2). [**Svalöf's winter wheat Skandia II. (01090 b_2)**].
Sverig. Utsädesfören. Tidskr. 1939 : **49** : 157–60.
The new variety, Skandia II, derived from Skandia I, has been selected with a view to the improvement of the hectolitre weight and in this respect it surpasses both Skandia I and Standard II and is only slightly inferior to Åring II. It is higher yielding than Skandia I, has straw as stiff and a baking quality equally as good as Skandia I, which it is likely to replace.

1434. 633.11:575(49·4)
633.11:575.242
Das Lehr- und Demonstrationsgut Rossberg-Kempttal. (**The teaching and demonstration farm at Rossberg-Kemptal.**)
Schweiz. landw. Mh. 1939 : Heft 5 : Pp. 44.
In outlining the methods adopted in breeding a cross-fertilized plant such as rye and a self-fertilized plant such as wheat, mention is made of a mutant plant of Rothenbrunn wheat found in 1936 and characterized by stronger straw and more firmly enclosed grains than the parent variety. It was constant from the start and is being tested for other characters.
Huron wheat has shown a relatively high mutation rate and efforts are being made to select constant strains of it.

1435. 633.11:575.11:575.243:537.531
Smith, L. 633.11:575.116.4
Mutants and linkage studies in *Triticum monococcum* and *T. aegilopoides*.
Res. Bull. Mo Agric. Exp. Sta. 1939 : No. 298 : Pp. 26.
Fifty-six viable mutants, mostly from X-rayed material, are described. All the X-ray mutants included are recessive, and they include many which cause disturbances in meiosis, e.g. partial or complete asynapsis or fragmentation of the chromosomes at first anaphase. In preliminary linkage studies it was shown that 97 combinations of factors were inherited independently, while nine pairs of factors showed strong linkage. Tentative linkage maps are given.

1436. Bumbeşti, A. I. D. 633.11:575.11:581.46
Ereditatea densitaţii spicului la grâu. (**The inheritance of ear density in wheat**).
Viaţa Agric. 1939 : **30** : 145–48.
An analysis of the hybrid H_{36}, supposed from its appearance to be the result of a cross between a *T. vulgare* and a *T. compactum* form showed that in fact the cross must have been between a form of homozygous *sub-laxum* (*AABBcc*) and a *densum* type (*AAbbcc*). Investigations up to the F_3 showed no *compactum* types among the progeny.
The results are in agreement with the interpretation of Raum (Cf. "Plant Breeding Abstracts", Vol. I, Abst. 505).

1437. Dolgušin, D. A. 633.11:575.12:575.148
(**The seed production work of the breeding and genetics institute**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 5 : 16–17.
Intravarietal crossing was carried out with 18 varieties of winter wheat. In only three cases was a reduction in yield observed, in seven there was no difference and in the remaining 25 yield increases varying from 0·5 to 3 c. per ha. were recorded. In spring wheats yield increases varying from 1 to 1·5 c. per ha. were obtained.
The conditions under which seed is raised have been found to influence the yield of the resulting plants and must be taken carefully into account in seed production.
Plants of Krymka produced by intravarietal crossing have proved more winter-hardy as well as more productive; the second generation was more uniform than the original uncrossed stock, a phenomenon which is claimed to be contrary to genetical theory.
Selection of the best families of Krymka and Hostianum 0237 according to rust and smut resistance and baking quality is also being conducted.

1438. Svetozarova, V. V. 633.11:575.127.2:576.16:576.354.4
Second genom of *Triticum Timopheevi* Zhuk.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 473–77.
Triticum Timopheevi has been crossed with all the principal species and varieties of wheat and the hybrids examined morphologically and cytologically.
Hybrids between *T. Timopheevi* and varieties of *T. dicoccoides*, and *T. Timopheevi* x *T. armeniacum* (Jakubz.) Makusch. are of special interest. The former crosses are less easily made (13·7 per cent successful) than the latter (22·9 per cent successful). The F_1 hybrids are intermediate in some characters but usually the general types of *T. dicoccoides* or *T. armeniacum* are dominant.
Meiosis in F_1 *T. Timopheevi* x *T. dicoccoides* is extremely irregular. In F_1 *T. Timopheevi* x *T. armeniacum* var. *Tumaniani* however meiosis is markedly different in that chromosome conjugation is regular and regular tetrads are formed. Most pollen however is entirely deformed.
It is suggested that non-functional pollen results from the fact that chromosomes of one species cannot be substituted for those of another during gamete formation.
Comparisons between hybrids of *T. Timopheevi* x 28-chromosome wheats and hybrids of *T. armeniacum* x 28-chromosome wheats show approximately the same irregularities and percentage of sterile pollen. This together with the regular behaviour of *T. Timopheevi* x *T. armeniacum* hybrids supports the suggestion that these two species have homologous genoms whose formula would be *AAgg* and not *AA*$\beta\beta$ as has been suggested by study of crosses of *T. Timopheevi* with *T. durum* and *T. persicum*. J. Wilson.

1439. Chin, Kuo-Chun. 633.11:575.127.2:581.183:575.114
Disjonctions singulières des hybrides interspécifiques de blés, engrains et froments (*Monococcum* x *Tr. vulgare*). (**Peculiar segregations of the interspecific wheat hybrids between *Triticum monococcum* and *T. vulgare***).
C.R. Acad. Sci. Paris 1939 : **209** : 240–42.
The occurrence of xenia in the grain from a cross of Monococcum Bellevue x Blé Hybride de la Paix (*T. vulgare*) is again mentioned (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 679).

A detailed description of the F_2 and F_3 is interpreted as demonstrating the operation of unilateral inheritance (as defined by Millardet) in interspecific crosses (Cf. Abst. 1377). Thus some plants were of the paternal type and some of the maternal type. But H 24 raised from an ear of the paternal type (F_2) gave an intermediate type (F_3) and the stems of M 23 grown from an ear like that of the maternal parent (F_2) resembled those of the original pollen parent Hybride de la Paix.

1440. Šekhurdin, A. P. 633.11:575.127.2:581.46
(**New varieties of awnless *Triticum durum*).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 4 : 14–15.

Selection among the progeny of crosses between *Triticum durum* and *T. vulgare* has led to the production of certain awnless forms of *T. durum* earlier in maturity than the awned *T. durum* forms at present cultivated, which they equal in yield and quality of grain; one form, Candicans 75/09 is drought resistant and has exceeded the awned forms in yield.
These awnless forms have been crossed with the best awned varieties of *T. durum* and given rise to awnless types with still higher and more regular yields. One of them, Mutico-valencia s-31 has outyielded the standards by up to 28·2 per cent in certain years, the grain being also superior in quality.
Still more promising forms are now being tested, some of them distinguished by still higher yields, some by drought resistance.

1441. Piacco, R. 633.11:575.127.5:633.14
Un ibrido fra frumento e segale. (**A hybrid of wheat and rye).**
Risicoltura 1939 : **29** : p. 151.

A sterile, F_1 hybrid of wheat (the Japanese variety Wase Ngubai) and a local variety of rye is briefly described.

1442. Nemlienko, N. E. 633.11:575.127.5:633.289
(**Results of work with *Triticum-Agropyron* hybrids).**
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 4 : 16–19.

At the Rostov station crosses have been made between various spring and winter wheats and *A. glaucum* and *A. trichophorum*. Higher sets were obtained with *Triticum durum* than with *T. vulgare* and the seed obtained was more viable. The F_1 hybrids were mainly of the *Agropyron* type, though intermediate in some characters. They were all frost resistant and perennial: in the second and third years they came into ear a fortnight before the common spring wheats. Fertility was much higher in the second and later years, some plants giving quite high sets by open pollination. About 1,400 F_2 plants were obtained, most of which were intermediate in type, though nearer to wheat than the F_1 hybrids were; 83·8 per cent of the F_2 hybrids of wheat with *A. glaucum*, both selfs and wheat back-crosses, behaved as perennials, the exact proportions varying in different parental combinations. Certain F_2 families stood out on account of their high fertility, which in all cases however was very much increased by growing the hybrids under favourable conditions.

1443. Popowa, G. I. 633.11:575.127.5:633.289:576.354.46
Cytologische Untersuchung eines neuen Bastardes *Triticum Timopheevi* x *Agropyrum elongatum*. (**Cytological study of a new hybrid *T. Timopheevi* x *A. elongatum*).**
Cytologia, Tokyo 1939 : **9** : 495–98.

The self-sterile F_1 hybrid of the cross *T. Timopheevi* ($n = 14$) x *A. elongatum* ($n = 35$) showed a maximum chromosome conjugation of 21 bivalents and 7 univalents, though the number of univalents was often larger. *T. Timopheevi* contains the A and G genoms and *A. elongatum* the genoms A, B, D, X_1 and X_2. It is concluded, therefore, that the maximum association of 21 bivalents arises from the pairing of A with A, B with G, and X_1 with X_2, the D genom of *A. elongatum* remaining unpaired.

1444. Uchikawa, I. 633.11:575.242:576.356.4
(Cytogenetic studies on short-normal type and dwarf compactum type in compactoid mutation).
Jap. J. Genet. 1938 : **14** : 264–67.

Continuing the work reported in "Plant Breeding Abstracts", Vol. VIII, Abst. 113, the author describes several new aberrant types which appeared in the progeny of a B type heterozygous speltoid. These are "dwarf compactoid", a highly sterile type with shorter stems and ears than "short compactoid", which can be sub-divided into two sub-types, No. 1 and No. 2, each of which may occur in the heterozygous "short normal" type (the one previously reported was heterozygous). The segregations occurring in these types are tabulated; all the heterozygous types have 41 chromosomes and the homozygous ones 40 chromosomes. Heterozygous short normal is $\frac{ABC}{BC}$, the homozygous form being $\frac{BC}{BC}$. No. 2 heterozygous dwarf compactoid is $\frac{ABC}{AC}$, the homozygote being $\frac{AC}{AC}$.

The heterozygous short normal, $\frac{ABC}{BC}$, is considered to be formed from the parental heterozygous speltoid, $\frac{ABC}{AB}$, by the elimination of an A chromosome in a gamete of the latter, giving a BC gamete which gives the new type on pairing with a normal ABC gamete. This short normal type occurs with a frequency of 4·64 per cent of the progeny of the heterozygous speltoid, while the No. 2 dwarf compactoid occurs with a frequency of 0·23 per cent.

1445. Bynov, F. A. 633.11:575.243:537.3
(Mutations in *Triticum vulgare* produced by the action of an electric current).
Trav. Jard. Bot. Univ. Moscow 1938 : **2** : 17–35.

Germinating seeds at the moment of bursting the seed coat were placed in a tube, at the ends of which electrodes were placed and currents of varying intensity were passed through, special precautions being taken to prevent heating of the seeds.

Speltoid mutants appeared in all the progenies, some being chimaeras of mutant and normal tissue. The frequency of mutation tended to increase with the exposure, this tendency being more clearly defined in experiments with direct than with alternating current.

The mutants segregated in the following generation into normal, heterozygous and homozygous speltoids, some families in the ratio 3·1:1·4:10 and others in the ratio 1·0:5·25:1·25. The normal plants proved to have 42 somatic chromosomes and normal meiosis, the heterozygotes 41 chromosomes and the homozygotes 40 + 1 fragment.

In addition to speltoids various other mutants occurred, e.g. various ear anomalies, including branched ears.

1446. Bynov, F. A. 633.11:575.243:578.088.2
(Centrifuging as a factor in mutation).
Trav. Jard. Bot. Univ. Moscow 1938 : **2** : 36–46.

Germinating seeds of *Triticum vulgare* at the moment of bursting the seed coat were centrifuged at 3,000 revolutions per minute for varying periods of time. The number of plants to germinate and to survive the winter was progressively less with increasing doses. The resulting plants contained various mutants, including partial and complete speltoids, which segregated in the following generation into normal, heterozygous and homozygous speltoids. The normal had 42 somatic chromosomes, the heterozygotes 43 + 1 fragment and the homozygotes 44 or occasionally 43. The proportions of mutants varied from 1 to 10 per cent.

The effect of centrifuging is thought to be through its action upon the consistency of the protoplasm.

1447. Ciferri, R. and Giglioli, G. R. 633.11:576.16(63)
La cerealicoltura in Africa Orientale. II. I frumenti piramidali, turgidi, polacchi e dicocchi. (**Cereal cultivation in East Africa. II. The *pyramidale, turgidum, polonicum* and *dicoccum* wheats**).
Ital. Agric. 1939 : **76** : 379–87.
The authors continue their descriptions of the varieties of 28-chromosome wheats found in Italian East Africa (Cf. Vol. IX, Abst. 1027).

1448. Sears, E. R. 633.11:576.356.52:576.356
Cytogenetic studies with polyploid species of wheat. I. Chromosomal aberrations in the progeny of a haploid of *Triticum vulgare*.
Genetics 1939 : **24** : 509–23.
Thirteen viable seeds were obtained by pollinating a haploid plant of *T. vulgare* with pollen from diploids. Eleven of the resulting plants showed abnormal meiotic behaviour, viz., the presence of univalents, trivalents or rings of four chromosomes. Nearly all these plants were abnormal in morphology, colour, size or vigour. Selfed seeds were obtained from all but one, which was fertile when crossed with a normal plant.
Nullosomics were obtained in the progeny of two monosomics. One of these was dwarf and sterile while the other was fertile and only slightly dwarfed. A tetrasomic plant, phenotypically indistinguishable from normal, was found in the progeny of a trisomic.
Crosses of eight monosomic plants of different origin with *T. durum* showed that five of the eight involved a chromosome homologous with one of those of *T. durum*.
Rings of four presumably represented segmental interchanges which resulted from crossing-over between partly homologous chromosomes in the haploid. From a plant with a ring of four a further aberrant type with an unstable chain of four was obtained.
The origin of the above abnormal type is discussed and it is pointed out that such plants provide the material for a new approach to the genetic analysis of *T. vulgare*.

1449. Lange de la Camp, M. 633.11-1.524.4(54)
Die Weizen der Deutschen Hindukusch-Expedition 1935. (**The wheats of the German Hindu Kush Expedition of 1935**).
Landw. Jb. 1939 : **88** : 14–133.
The wheat collection made by the Hindu Kush expedition consisted of 849 specimens, most of which proved to be very mixed, so that 553 different forms of winter wheat and 1800 of spring wheat were finally isolated. The characters used in the classification of the types are described and discussed and the conclusion is reached that, with all its imperfections, the Körnicke system is the only practically applicable one.
All the winter forms proved to be hexaploid but a few tetraploids occurred among the spring forms; certain doubtful forms proved to be hybrids.
Certain definite types, characterized by particular combinations of morphological and physiological characters, were found to be associated with particular localities; thus (1) the awnless group of the Punjab consists of quick-growing spring wheats, possesses field resistance to yellow rust, a higher baking quality than the awned group and so on; (2) the west Hindu Kush group consists of awned forms with lax ear, mostly of winter habit, with large, long and vitreous grains of low baking quality; (3) the Chitral group has thin glumes firmly enclosing the grains and free from pubescence and is generally low in breeding value. The fourth and last group is characterized also by thin glumes but grains not firmly enclosed, lax ears pointed at the tip and is confined to the south of the Hindu Kush. There also occurs a characteristic group of half-awned wheats.
As regards their value as breeding material, very few of the wheats possessed any degree of frost resistance. Most of them were badly attacked by *Ustilago tritici*, especially the Indian group; the Iranian *inflatum* type was resistant to all physiological forms. Certain forms remained free from attack by *Tilletia*. Field resistance to yellow rust is found in nearly all the Indian forms; group 2 is mainly susceptible, group 3 partially resistant, while in group 4 the spring

2 were varieties of *T. monococcum*, 2 of *T. dicoccum*, 15 of *T. durum* and 79 of *T. vulgare*. *T. persicum* and *T. Timopheevi* were also tested. Only five varieties showed less than 30 per cent of infection and none of these was of *T. vulgare*. Four *T. vulgare* wheats, Heines Kolben, Hope, Richelle blanche hâtive and strain 73 from the cross Peragis x Fürst Hatzfeld, were included in the group with 30–60 per cent infection. None of the five lines of bunt attacked *T. Timopheevi*.

Changes in the virulence of the organism when multiplied on the test variety were investigated and confirmed. Experiments were made on the infection of the test collection with spore mixtures and the question of the methods of using single lines or mixtures when testing for resistance is discussed.

1457. Chesnokov, P. G. 633.11–2.7–1.521.6:581.9
Geographic variation of wheats in their resistance to Hessian fly (*Phytophaga destructor* Say).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 287–91.

The reaction of a large range of wheat forms to Hessian fly was studied. *T. monococcum* and *T. Timopheevi* are only slightly susceptible, *T. persicum* shows medium and *T. sphaerococcum* strong susceptibility. Most *T. dicoccum* forms are also strongly susceptible. Within both *T. durum* and *T. vulgare* a very wide range of susceptibility occurs and the geographical distribution of susceptible and immune forms is discussed. No single observable morphological character is invariably correlated with resistance to the fly.

1458. Oparin, A. J. 633.11:664.641.016:578.08
(Biochemical indices of the baking quality of grain and flour).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1939 : 43–70.

The sugar content of a flour has been found to influence its gas producing capacity, the colour of the crust and the water absorbing capacity of the dough produced. The proportion of small starch grains also influences the gas production.

The rapidity of the proteolytic processes is another factor which varies, even in samples of flour of identical initial gluten properties and tests of gluten strength are valid only if made after the dough has stood for 3 hours. The commonly applied methods are regarded as vitiated on this account. Differences in consistency of the dough also come to full expression only after standing for 3 hours. The rapidity of proteolytic action is influenced both by the activity of the proteolytic enzyme and by the susceptibility of the protein to its action, both of which factors vary from variety to variety.

BUCKWHEAT 633.12

1459. Kopel'kievskii, G. V. 633.12:575(47)
(Breeding and seed production in buckwheat).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 5 : 34–36.

The famous variety Bogatyr' was produced at the Šatilovo station by mass selection of the largest grains, which were removed from the smaller fractions by sieving. It is distinguished by unusually large and good quality grain and a high meal extract. Very few of the many forms from other regions that have been examined can compare with it, though some are promising as parents for crossing, e.g. some of the Indian and Chinese forms with exceptionally large numbers of flowers per plant.

The old land races have displayed great drought resistance and are being subjected to selection.

OATS 633.13

1460. 633.13:575(47)
Kopel'kievskii, G. V. 633.13:575.12(47)
(New promising lines of oats of the Šatilovo Breeding Station).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 1 : 9–12.

An account of the work of the station in 1937 and 1938 and on the performance of new strains in variety trials. Most of the new forms are of hybrid origin.

1461. Lewicki, S. 633.13:581.48:519.241.1
Badania nad wartością ziarna owsa Plonu 1936 r. [**The quality of oats cultivated in Poland (crop of 1936 year)**].
Prace Laborat. Badania Jakościowej Wartości Zbóż, Puławy 1939 : No. 23 : Pp. 48.

Data are given concerning the main grain characteristics of a number of varieties grown in Poland. A pronounced negative correlation was observed between husk percentage and hectolitre weight, a slight negative correlation between husk percentage and protein and fat content. A small positive correlation between fat content and hectolitre weight and protein content and 1000 corn weight was observed; correlations between protein content and hectolitre weight were very low but all negative, those between fat content and 1,000 corn weight varied.

1462. Pohjakallio, O. 633.13–2.451.2–1.521.6:575
Beiträge zu den Untersuchungen über die Brandresistenzzüchtung des Hafers. (**Contributions to the investigations on the breeding of oats for smut resistance**).
Maataloust. Aikakausk. 1939 : **11** : 183–97.

The differences in susceptibility found in naturally and artificially inoculated material are discussed in relation to the floral biology, the tillering and the removal of the glumes.

1463. Voss, J. 633.13–2.451.2–1.521.6:576.16
Zur Prüfung der Resistenz von Hafersorten gegen Flugbrand [*Ustilago avenae* (Persoon) Jensen]. [**Testing the resistance of oat varieties against loose smut (*U. avenae* (Persoon) Jensen)**].
Z. Pflanzenz. 1939 : **23** : 20–46.

The resistance of oat varieties against loose smut and the virulence of loose smut collections from different parts of Germany were tested, using Reed's method. The grains are sterilized with absolute alcohol and then mixed with the *Ustilago* spores. The results showed that for plants grown in the greenhouse the degree of infection was as high as or higher than in plants grown outside.

Mildly virulent types of loose smut were found to be present in all parts of Germany, but highly virulent types were not so common. Therefore, not only highly resistant varieties of oats, but also those varieties resistant only to weakly virulent forms of loose smut, are of practical importance in combating the fungus. About 20 per cent of the varieties tested were of the partially resistant kind which are resistant only to the weakly virulent strains of smut. In addition two varieties were found to be highly resistant even to the highly virulent types of smut. H. W. H.

1464. Sukhov, K. S. and
Vouk, A. M. 633.13–2.8–1.521.6
(Damage caused by "Zakuklivaniye", a mosaic disease of oats, and mode of its distribution in nature).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1939 : 121–44.

A new virus disease of oats, transmitted by *Delphax striatella*, and consisting of a rosette-like stunted growth, excessive tillering, sterility and various floral anomalies, is described. It attacks all species of *Avena* so far tested and no truly resistant form has yet been observed, though Golden Rain tends to be less severely attacked than most varieties. The disease does not usually affect all plants in a field and selection of the surviving individuals is to be practised in the hope of obtaining resistant strains.

1465. *Staniszkis, W. 633.13.00.14(43.8)
Doświadczenia z odmianami owsa przeprowadzone w Polsce w latach 1923–1935. (**Experiments with oat varieties carried out in Poland in the years 1923 to 1935**).
Prace Nauk. Rol. (Pap. Agric. Res.) Supplement to Przegl. Doświad. Roln. (Rev. Agric. Res.) 1939 : No. 5 : Pp. 65.

Reports are given on the performance of a number of varieties in the various zones of the country as regards yield, together with data on their grain weight, husk percentage, hectolitre weight and resistance to rust and smut and brief descriptions of the varieties.
No confirmation of the view that early varieties have a higher husk percentage than late varieties was found.

RYE 633.14

1466. Kress, H. 633.14:519.241.1:631.557
Die gegenseitigen Beziehungen von Wachstumsbeobachtungen und Ertragsleistungen und ihr Einfluss auf die Wertbestimmung der Nachkommenschaft, nachgewiesen am Petkuser Roggen. (**The correlation between growth observations and yield and its influence on the evaluation of the progeny, demonstrated on Petkus rye**).
Inaug-Diss. Erlangung Würde Dok. Landw., Landw. Fak. Rhein. Friedrich-Wilhelms-Univ. Bonn 1938 : Pp. 61.

A description is given of the method of producing Petkus rye, consisting in repeated élite selection combined with spatial isolation. The author is of the opinion that in consequence of this process Petkus constitutes a fairly homozygous population suitable for establishing correlations. The method of calculating the correlation coefficients is described.
Correlations of 0·2 to 0·5 between stand (vigour of growth and tillering) and yield were observed. The values for the élites and their progenies in the following year correspond fairly closely, showing the hereditary nature of the character studied. Positive correlations were observed also between yield and leaf width and early earing; there was a slight negative correlation between yield and height of straw, except in the short classes, where a reduction in height was accompanied by a reduction in yield. These are considered to be of value in selection and breeding work.
Correlations were absent or very low between yield and leaf colour and glaucousness.

1467. Shmargon, E. N. 633.14:576.312.342
Chromomere structure of the chromosome set of rye.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 267–69.

By subjecting roots to low temperatures (0° C.) for 24 hours and fixing with strong platino-formalin, the chromomere structure of each of the somatic chromosomes of rye (*Secale cereale*) has been analysed.
It is possible to identify each chromosome morphologically by the number and distribution of the chromomeres present. In split regions of any chromosome, pairs of chromomeres are absolutely homologous both as regards size and position. The chromomeres proper are compound in structure and may be regarded as centres of condensation of chromatin.

J. Wilson.

1468. Breslavetz, L. 633.14:576.356.5:537.531
Polyploids in rye induced by X-rays.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **22** : 354–57.

Among 533 rye plants X-rayed in the seedling stage, two were found to be tetraploid. In addition, polyploid cells and sectors were found in many other X-rayed plants. The tetraploid plants showed the usual increase in the size of cells, nuclei and pollen grains as well as in the number of nucleoli per nucleus.

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* An extended summary of this paper is on file at the Bureau.

1469. CAMARA, A. 633.14:576.356:581.036
Efeitos do calor sôbre a microsporogénese do *Secale cereale*. (**Effects of heat on microsporogenesis in *S. cereale*).**
Scientia Genetica 1939 : **1** : 86–102.

The literature on meiosis in rye, in particular that devoted to the $2n = 16$ form, is discussed. Plants of *S. cereale* L. var. *vulgare* Körn were subjected for 1 hour to temperatures of 35°, 40° and 45° C. Meiosis is described, first in normal plants, where considerable variations in chiasma number are reported even in untreated material. In the longer treatments a reduction in the number of chiasmata was noticed, sometimes pairing even failed altogether. Abnormal orientation of the chromosomes suggested that the centromere had been in some way inactivated. Complete asynapsis was occasionally observed, with the consequent production of diploid microspores. Trivalents, unequal bivalents, fragmentation, fusion of chromatids, chromosome bridges and non-disjunction of certain chromosomes were among the anomalies detected. The types of non-disjunction and inversion observed were such as to produce occasional tetrasomics and it is suggested that temperatures of this order, which not infrequently occur in nature, may have been responsible for the production of the ryes with $2n = 16$.

1470. 633.14:581.143.26:575.127.2
REZNIČUK, S. P. 633.16:581.143.26:575.127.5
[**Perennial rye (preliminary communication)**].
Sotsialističeskoe Zernovoe Khozjaistvo (Socialistic Grain Farming) Saratov 1939 : No. 4 : 87–90.

Crosses of perennial wild barley (*Hordeum bulbosum*) and *Elymus* species with cultivated barley, and of wild rye (*Secale montanum*) with Petkus rye were attempted in 1935 with the object of obtaining perennial cultivated forms. The *Elymus* and cultivated barley cross gave no seed but from the other two combinations seed was obtained, though the "hybrids" from the attempted cross of the wild perennial and the cultivated barley ultimately proved not to be genuine.

The wild perennial rye crossed with Petkus gave in 1938 forms which are regarded as promising for breeding high yielding perennial and annual rye. The advantages of the perennial type hybrids are stated. Their defects are lack of uniformity in the time of ripening and a brittle ear.

MAIZE 633.15

1471. 633.15:575(43.7)
FRIMMEL, F. 633.15:575.125
Die nächsten Ziele der Maiszüchtung und die Ausnützung des Heterosis-Prinzipes für Futtermais. (**The immediate aims of maize breeding and the utilization of the principle of heterosis for forage maize).**
Časové Otáz. Zeměd. 1938 : **69** : 37–43.

The steps to be taken for the further improvement of maize are considered. For maize for grain, higher yield and increased nutritional value of the grain are required. For green fodder maize the need is for an increased green mass. For silage maize, besides an increased green mass, a higher number of cobs is required. For the different types of maize different characteristics are required and earliness, growth and number of cobs, form of the cob and grain size and quality are considered in relation to grain, silage and fodder maize and directions are given for making practical use of heterosis. The "ever flowering" character should also be utilized for the production of silage maize.

1472. FLEISCHMANN, R. 633.15:575(43.91)
Neue Richtungen in der Maiszüchtung im Dienste der Maiskultur und der Maisbau in Ungarn. (**New trends in maize breeding in the service of maize cultivation and maize growing in Hungary).**
Časové Otáz. Zeměd. 1938 : **69** : 28–36.

The aims of the breeder for the improvement of maize are outlined and a short account is given of the cultivation of maize in Hungary including a list of the Hungarian varieties grown, their origin and by whom they were bred.

1473. Zapparoli, T. V. 633.15:575(45)
Derivati del granoturco Nostrano dell'Isola. Nostrano dell'Isola, Finardi (S.M) Isola Basso (S.M)—Letizia (S.M). [Derivatives of the maize variety Nostrano dell'Isola: Nostrano dell'Isola, Finardi (S.M)—Isola Basso (S.M)—Letizia (S.M)].
Ital. Agric. 1939 : **76** : 317–26.

In the three varieties named in the title the first, Nostrano dell'Isola Finardi was the product of mass selection and the other two the products of pedigree selection from the variety Nostrano dell'Isola, a variety of unknown origin, long cultivated in a certain region in the north of Italy. The three new varieties, which are described, represent various improvements on the original variety and are adapted to different conditions.

1474. Karp, M. L. 633.15:575:578.08(47)
Improvement of varieties of Indian corn through inbreeding combined with cross-pollination.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **22** : 613–14.

The author suggests the following method as a means of improving varieties of maize in as few as three generations. The best available inbred line is crossed with an open-pollinated variety and a large number of plants from the F_1 progeny are selected and selfed for one generation. The best inbred families are in the next generation bulked together and allowed to interpollinate

1475. 633.15:575.11:631.811
Harvey, P. H. 635.64:575.11:631.811
Hereditary variation in plant nutrition.
Genetics 1939 : **24** : 437–61.

Inbred lines of maize were found to differ significantly in their efficiency in utilizing ammonium nitrogen, efficient utilization being partially dominant. Inbred strains also showed inherent differences in the percentage of dry matter in the tops, in their tolerance of the higher concentrations of ammonium, and in their top-root ratios.
Strains of *Lycopersicon esculentum* and *L. pimpinellifolium* were grown on three deficient nutritional solutions (low N, low P and minus K) and showed differential responses to these deficiencies. The differential response to potassium levels was inherited, apparently on a complex genetic basis. The F_1 hybrids do not show complete dominance.

1476. Jenkins, M. T. 633.15:575.12:581.192:581.48:581.6
New developments that may affect the corn industries. The importance of corn hybrids to the corn industry.
Contr. Ia Corn Res. Inst. 1939 : **1** : 208–12.

It is pointed out that the adoption of the method of crossing selected inbred lines to produce hybrid maize has for the first time rendered possible the production of maize varieties of special chemical composition for use for particular purposes in the milling trade. It is shown that inbred lines and hybrids differ greatly in chemical composition in such ways as the following: type of protein, proportion of insoluble and soluble starch, content of carotinoid pigments of the grain as a whole and of the scutellum, and amount of cellulose in the stalks. By suitable selection of lines it should be possible to create hybrids suited to widely different industrial uses.

1477. Karp, M. L. 633.15:575.14(73)
(The practical utilization of inbreeding in the U.S.A.).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 2–3 : 28–31.

A review of the work on maize, with some incidental comments on degeneration and heterosis. Russian workers should examine the possibilities of obtaining increased yields of various crops by inbreeding.

1478. Jones, D. F. 633.15:575.14:575.125:575.242
Continued inbreeding in maize.
Genetics 1939 : **24** : 462–73.

Of four original lines of maize, three have been continuously self-fertilized for 30 generations. The remaining original line and one sub-line separated in the second generation failed to survive, this failure being due in at least one case to a degenerative change that apparently could not be checked by selection of normal plants to continue the line. Reduction in plant height ceased after five generations and in yield after 20 generations. In some cases six lines separated at various stages clearly differed from each other, such differences being attributed to mutation rather than to delayed segregation.

After 20 generations of selfing the lines were homozygous for all visible characters and for loci having an effect upon hybrid vigour.

Throughout the period of inbreeding no favourable mutation was observed.

1479. 633.15:575.242:581.46
Sprague, G. F. 635.67:575:575.242:581.46
Heritable characters in maize. 50—Vestigial glume.
J. Hered. 1939 : **30** : 143–45.

Vestigial glume is determined by a single dominant gene *Vg*. Plants carrying this gene have glumes varying from awl-shaped vestiges to one third the normal length. They have smaller tassels than normal and rarely shed pollen, since the anthers are exposed and usually dry up before dehiscence occurs. When pollen is shed, however, it is viable.

The gene has not yet been obtained in the homozygous condition but there is no reason to believe that this is impossible. It is situated in chromosome I, between f_1 and *br*.

The cobs of vestigial glume maize have much reduced glumes and the character might have some commercial significance if it could be introduced into sweet corn hybrids used for canning. At present a portion of the glumes often adheres to the grain of sweet corn, and it would be advantageous if this could be avoided. The gene *Vg* is therefore being introduced into Purdue 39, the female parent of Golden Cross Bantam, by the back-cross method. It may, however, prove impracticable to maintain it in a homozygous condition in the line.

1480. Hadjinov, M. I. 633.15:575.246.061.6
A dominant mutable gene for purple colour in the R series of multiple allelomorphs in maize.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 366–69.

A new frequently mutating dominant gene for purple plant colour, R^{pg}, is described and its transmission analysed.

This gene may affect all plant parts exposed to light, except the anthers which are green in colour. Analysis of various F_1 and F_2 progenies shows that the new gene occupies a dominant position with respect to plant colour in the *R* series of multiple allelomorphs but is recessive with respect to anther colour.

The gene R^{pg} mutates only to R^{gg} (green with green anthers), a recessive allelomorph, mutation occurring during all stages of ontogeny at a very high rate. J. Wilson.

1481. Gudkov, I. N. 633.15–2.112:581.162:581.162.5
(Drought and the flowering process in maize).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 2–3 : 21 24.

A study of flowering in numerous varieties of maize under drought conditions with special reference to the effects on the male and female inflorescence. The incidence of sterility and the importance of the findings for maize breeding are indicated.

BARLEY 633.16

1482. Menabde, V. L. 633.16(75.8)
[**Barleys of Georgia (Botanic-taxonomical outline)**].
Trav. Inst. Bot. Tbilissi 1938 : **6** : 181–246.

After a general account of barley cultivation in Georgia from the earliest times, data are given

regarding the vegetative, ear and grain characters of the barleys now growing there. Information is given also on a number of biological characters, including resistance to diseases and pests; some of the forms have proved relatively resistant to frit fly owing to their very vigorous tillering during the period of attack. Many forms with high resistance to *Puccinia graminis* and *P. glumarum* have also been observed. Large grain, thin husk, freedom from shedding and from lodging are other valuable characteristics of many of the forms.
A key for the determination of the systematic groups is provided and many of the forms are illustrated. The range of variation in the different characters is discussed and is demonstrated by means of tables. As many as 53 botanical forms were identified and natural hybrids were frequent. The great variability of the characters leads the author to regard Georgia as part of the Transcaucasian centre of origin of cultivated barleys. The Georgian forms cross readily with those from the Abyssinian and Chinese centres, giving fertile hybrids. Both in these crosses and in crosses with wild barley (*Hordeum spontaneum*) very wide segregation occurs and the crosses are thought to be of great interest from a practical point of view. No success has been obtained in attempts to cross the Georgian barleys with other wild species, such as *H. murinum, H. crinitum* and *H. bulbosum.*

1483. Löfgren, N. 633.16:575.242.061.6:581.192
Tryptophan und Chlorophyll in Keimblättern mutierender Gerstesorten. (**Tryptophane and chlorophyll in the cotyledons of mutating barley varieties**).
Hoppe-Seyl. Z. 1937 : **241** : 142–47.
Investigations in X-ray mutants showed that homozygous and heterozygous greens were identical in chlorophyll content. The chlorophyll contents for various of the mutants are given. They seemed to show a greater variation in the ratio of chlorophyll a to chlorophyll b than in normal plants, and there were indications of a definite ratio between the chlorophyll contents of the different types of mutants.

1484. Schiemann, E. 633.16:576.16
Neue Probleme der Gerstenphylogenie. (**New problems in barley phylogeny**).
Züchter 1939 : **11** : 145–47.
The new, wild, six-rowed barley species, *Hordeum agriocrithon* (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 745) is discussed from the point of view of phylogeny. The wild, two-rowed *H. spontaneum* probably represents the ancestral form of cultivated two-rowed barleys, but the origin of the six-rowed forms has up to now been obscure. The new discovery is likely to solve the problem.

1485. Blinova, N. P. 633.16:581.162.32:578.08
(**On the technique of crossing spring barley**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 2–3 : 36–39.
The following aspects are discussed on the basis of experimental findings; methods of emasculation, the best time for emasculation and pollination, pollen collection and storage, pollination of severed ears, the group method of pollination and intra-varietal crossing.

1486. Meyle, A. and
Rosenstiel, K. von 633.16–2.111–1.521.6:575
Die Winterfestigkeit der Wintergerste. Möglichkeiten der Steigerung durch züchterische Massnahmen. (**The winter-hardiness of winter barley. Possibilities of raising it by breeding**).
Mitt. Landw. 1937 : **52** : 762–63.
German barleys, though none are truly frost resistant, require a long period of low temperature to induce earing and in the intervening rosette stage are somewhat cold resistant. Rumanian barleys on the other hand fail to ear when autumn sown owing to the short day and are

also somewhat hardy in the rosette phase. Crosses have been made between the two types in the hope of combining the two kinds of resistance.
Some selections from recent crosses have combined hardiness equal to any existing form with earliness of maturity equal to Peragis.
By crossing naked barleys with winter forms it has been possible to produce naked winter varieties with quite good yields.

1487. Christoff, M. A. 633.16–2.111–1.521.6:578.08
Untersuchungen über die Kältefestigkeit der Wintergerste. (**Researches on the cold resistance of winter barley**).
Z. Pflanzenz. 1939 : **23** : 47–90.

In the two winters of 1936–37 and 1937–38 the cold resistance of many winter barley varieties was determined by field observations on plants grown outside, by the direct freezing method and by two indirect methods, determinations of osmotic pressure and of total sugar concentration. The direct freezing method—the plants are grown in a greenhouse at 15–20° C., hardened at 5° C. for 5–6 days, and then subjected to −7° C. for 36 hours—gives results which coincide approximately with the field observations. The two indirect methods are only useful for giving a rough idea of the cold resistance. The varieties are classified into very resistant, resistant, somewhat resistant, susceptible and very susceptible.
The action of environmental factors on cold resistance was studied by using three standard varieties, Echendorfer (very susceptible), "Friedrichswerther" (resistant), and Mahndorfer (very resistant)—only the first two varieties were used in the first winter. The environmental factors studied were hardening temperature, soil moisture, manuring and time of sowing. Two wheat varieties were also used for comparison in some of these experiments.
Hardening in barley takes place at temperatures both above and below 0° C. After hardening, the osmotic pressure, the concentration of dry matter and the total sugars concentration are all increased. The differences in behaviour of barley varieties of different degrees of cold resistance are small and very variable. Differences in soil moisture content and manuring have a large effect on cold resistance. The osmotic pressure and the monosaccharide concentration increase with age of plant. H. W. H.

MILLETS AND SORGHUMS 633.17

1488. Zakladnyi, G. A. 633.171:575(47)
(**Results of work with millet**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 5 : 36–37.

The variety Šatilovo 042, produced by individual plant selection from local material, has surpassed all other strains and is being subjected to further improvement. Selection is also being carried out on other varieties.

1489. Couch, J. F.,
Briese, R. R. and
Martin, J. H. 633.174:581.192.6:575.22
Hydrocyanic acid content of sorghum varieties.
J. Wash. Acad. Sci. 1939 : **29** : 146–61.

Samples of the plant and leaves of 33 sorghum varieties grown at one or more of six stations in the area of the Great Plains were analysed for HCN at various stages of growth.
The amount varied considerably but it was found that any variety might at times contain enough HCN to be toxic to animals.
Feterita, hegari, Chiltex and Sumac sorgo tended to be high in HCN, milo, darso, Atlas sorgo and Kansas Orange sorgo were intermediate, Leoti sorgo, "African Millet" sorgo and a selected strain of Dakota Amber sorgo were low.
A wide range of variation was shown among varieties of Kafir.

1490. VIGUIER, P. 633.18:575(66.2)
La riziculture indigène au Soudan Français. **(The native cultivation of rice in French Sudan).**
Ann. Agric. Afr. Franç. Etrangère 1937 : **1** : 287–326; 1938 : **2** : 31–89, 123–54.
A full account of rice cultivation in the French Sudan, including a classification of the rices grown and descriptions of the varieties cultivated.
As all the rice grown is consumed locally, selection should be directed towards producing homogeneous varieties adapted to local needs and conditions.

1491. PIACCO, R. 633.18:575.12:575.242
Fenotipi ottenuti dall'incrocio Nano x Nanetto. **(Phenotypes obtained from the cross Nano x Nanetto).**
Risicoltura 1939 : **29** : 164–69.
Both these varieties of rice are mutant forms. Nanetto, used as the female parent, is almost dwarf with excessive tillers, very thin stems, drooping rachis and violet coloration in the interior of the stem. Nano is dwarf with much reduced spikelets, yellow coloration in the interior of the stem and erect rachis.
The F_1, on the whole, resembles the female parent. In the F_2 the type Ukeai reappeared from which Nanetto was derived, and two sub-normal types, an intermediate type and the parental types were also present. Further investigation in the F_3 showed the dominance of the intermediate height, abnormal tillering, normal, oval-shaped grains and the thin panicle of Nanetto.

1492. OKURA, E. 633.18:575.127.2:576.354.4:576.16
(Cyto-genetical studies on *Oryza*).
Jap. J. Genet. 1937 : **13** : 212–14.
The author agrees with Morinaga (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 715) that the cross O. *minuta* ($n = 24$) x *O. sativa* ($n = 12$) is most easily effected when the latter species is the female parent.
The F_1 *O. sativa* var. Taichiu-65 x *O. minuta* was completely male-sterile. The somatic chromosome number of the hybrid was observed to be 36. At meiosis the modal chromosome arrangement was $2_{III} + 10_{II} + 10_{I}$, the range being $0–2_{III} + 10–12_{II} + 10–16_{I}$. It is considered that one of the two genoms of *O. minuta* is therefore homologous to the genom of *O. sativa*, the constitution of the two species being represented as AD and A respectively.
Morphological and cytological studies indicate that *O. minuta* is more nearly allied to *O. sativa* than is *O. latifolia*.

1493. PIACCO, R. 633.18:575.242:581.49
Comportamento genetico di una mutazione dell' "*Oryza sativa*". **(The genetical behaviour of a mutation of *O. sativa*).**
Risicoltura 1939 : **29** : 134–37.
A mutant, lacking ligule and auricles, is described. The character behaved as a simple recessive when crossed with normal varieties.

1494. AKEMINE, M. 633.18:581.162.5:575:519.24
(Analysis of variance as applied to the intervarietal difference of sterility in paddy rice).
J. Sapporo Soc. Agric. For. 1939 : **31** : No. 149 : Pp. 14.
The data considered consist of trials on thirty-two paddy varieties conducted over fourteen years. Differences in percentage sterility were estimated by means of the analysis of variance, and found to be significant, even within groups differing in time of maturity. Using the standard error the varieties were ranked in order of sterility percentage, and finally a seasonal ranking was carried out.
J. W.

HERBACEOUS FORAGE PLANTS 633.2

1495. Cugnac, A. de 633.262:575.127.2
Reconstitution experimentale d'une graminée éteinte, par un croisement interspécifique. (Experimental reconstitution of an extinct gramineaceous plant by interspecific crossing).
C.R. Acad. Sci. Paris 1939 : **209** : 61–63.

A form resembling the extinct variety, *Bromus arduennensis* var. *villosus* Crép., has been recovered in the F_2 of a cross between the glabrous *B. arduennensis* and *B. grossus* var. *velutinus*.

LEGUMINOUS FORAGE PLANTS 633.3

1496. 633.321:575.11.061.6:581.46
Nijdam, F. E. 633.321:575.116.1
The colour of the flowers of *Trifolium pratense* L.
Genetica 1939 : **21** : 16–28.

The following factors are postulated: *G*, a dominant producing anthocyanin, *gg* individuals having yellowish-white flowers; *B* and *E* together producing purple red in the presence of *G*, *bb* flowers being pink, *ee* blue and *bbee* pink with a dull blue shade, not easily distinguished from pink. The intensity of all these anthocyanin colours varies a great deal; this is attributed to a series of polymeric factors which is believed to act on all the colours in the same way.
Some evidence of linkage between *B* and *E* was found, with about forty per cent of crossing-over. Aberrant ratios obtained in certain crosses may, it is suggested, be due to linkage of one of the flower colour factors with the self-incompatibility factors. *G* is believed to be independent of *B* and *E*.
The flower colours are illustrated by coloured plates. J. L. F.

1497. Åkerberg, E. and
Schwanbom, N. 633.322:575(48.5)
Weibulls Robusta-vitklöver. En ny vitklöverstam av Strynö-typ. (Weibull's white clover *Robusta*. A new strain of white clover of the Strynö type).
Weibulls Ill. Årsb. 1939 : **34** : 21–24.

Robusta has been produced by repeated selection from the variety Strynö followed by strain building. It has a high yield during the summer and is resistant to drought. The results of comparative trials are given.

1498. Koltzoff, N. K. 633.35:576.356.5:581.04
On the methods of artificially inducing polyploids by treatment with colchicine.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 482–85.

Using vetch seeds, a series of experiments to determine the concentrations of colchicine at which poisoning is reduced to a minimum without eliminating the capacity to produce polyploidy, is described.
Solutions ranging from 0·2 to 0·0006 per cent colchicine were used and both germinated and ungerminated seeds treated for periods of 1 to 12 days, after which some seeds were examined cytologically and others planted out.
Seeds previously germinated responded more rapidly to treatment and produced polyploid roots (tetraploid, octoploid and multiploid) more readily than ungerminated seeds.
The effectiveness of colchicine treatment in vetch varies little within the concentration limits of 0·2 per cent to 0·0006 per cent, the lower concentrations having less injurious effect upon the seeds and permitting a higher percentage of germination after treatment. J. Wilson.

1499. Griesinger, R. and Klinkowski, M. 633.376:576.312:581.9 633.376:575.12
Geographie und Cytologie des europäischen Formenkreises der Gattung *Ornithopus*. (**Geography and cytology of the European forms of the genus *Ornithopus*).**
Züchter 1939 : **11** : 147–61.

The forms discussed are:—*O. compressus* L., *O. perpusillus* L., *O. isthmocarpus* Coss., *O. sativus* Brot., and *O. macrorrhynchus* (Willk.) Klink. et Schwz. *O. pinnatus* (Mill.) Druce is also mentioned. In the first part of the paper their distribution throughout Europe is recorded.
Investigation on the cytology of Seradella species showed that the diploid chromosome number is 14. The morphology of the chromosomes, which is very similar in all the species examined, and the course of meiosis are briefly described. The causes for the failure of crossing experiments are discussed and it is suggested that the lack of a suitable crossing technique is responsible and not any disturbance of the chromosomes.
A number of natural species hybrids are noted, including *O. macrorrhynchus* (= *O. sativus* x *O. isthmocarpus*). It is hoped that the use of the colchicine method may overcome the difficulties of crossing and that desirable hybrid types may be obtained.

ROOTS AND TUBERS 633.4

1500. Lamprecht, H. and Hertzman, N. 633.4:575(48.5)
Nya förädlingsresultat med rotfrukter vid Weibullsholms Växtförädlingsanstalt. (**New breeding results with root crops at Weibullsholm Plant Breeding Institute).**
Weibulls Ill. Årsb. 1939 : **34** : 5–11.

Individual selection has produced Slättbo Barres, strain 16, a fodder beet selected from Slättbo, strain 76; Cylinder Barres, strain 18, from Slättbo Barres, strain 76 and Ped. Bortfelder, strain 4, a new turnip selected from Ped. Bortfelder, strain 54. All these new strains, which are briefly described, are superior in certain respects to the parent strains. Crossing has produced the following noteworthy strains:—Balder, strain 99, from the cross between Drottning (Queen) and Trondhjemsk is a swede with high yield and a good shape; Oden, strain 7, from Tidig Vit (Early White) x Bangholm is among some of the best swedes; Immuna, from Ped. Bortfelder x Naepe turnip is more resistant to club root than any other turnip or swede on the market; Ped. Bortfelder, strain 19 from Ped. Bortfelder x Tellus is an improvement on the turnip strain 96.
Crosses have been made between swedes and turnips. A number of the F_3 lines have shown considerable resistance to club root.
Other lines, at present only assigned numbers, from various crosses are described.

1501. Lamprecht, H. and Hertzman, N. 633.4:575(48.5)
Weibullsholms Växtförädlingsanstalts Original-Rotfruktsstammar. (**The original strains of root crops at Weibullsholm Plant Breeding Institute).**
Weibulls Ill. Arsb. 1939 : **34** : 12–20.

Strains of root crops bred at Weibullsholm, beets, turnips, swedes and carrots for forage are briefly described.

1502. Crescini, F. 633.491:575(45)
Indagini sulle patate nel settore autarchico. (**Investigations on potatoes in the autarkic area).**
Ist. Agron. Gen. Coltiv. Erbacee R. Univ. Bologna 1938 : Pp. 36.

Seeds were obtained from the varieties Millefiori, Böhms Allerfrüheste Gelbe, Majestic, Nostrana and Americana and gave a germination per cent of 92·5 when grown in the light at 18–20° C. Great variation was observed in the progeny in respect of morphological

features, habit of growth, phenomena of degeneration in tuber characters and in fertility. The plants remained green much longer than plants reproduced vegetatively. There was no correlation between yield of tubers and vegetative development or degree of degeneration.

1503. Nilsson, F. 633.491:575(48.5)
Potatisförädling för Norrland. (Potato-breeding for Norrland).
Sverig. Utsädesfören. Tidskr. **1939 : 49 : 137–47.**
A short account of the development of potato-breeding in Norrland. The main object is the production of a strain resistant to *Phytophthora* and to this end Parnassia, King George V and the locally much cultivated variety Mandel have been crossed with Bolivia No. 1; the results are promising, especially in the cross Bolivia No. 1 x Mandel.

1504. Bukasov, S. M. 633.491:575.127.2
Interspecific hybridization in the potato.
Physis, B. Aires **1939 : 18 : 269–84.**
The main substance of this paper has already been reviewed in "Plant Breeding Abstracts", Vol. IX, Abst. 1094.

1505. Decker, S. 633.491:575.127.2
Problemas geneticos referentes á batatinha (*Solanum tuberosum* e affins).
[Genetical problems concerning the potato (*S. tuberosum* and related species)].
Bol. Agric., S. Paulo **1937 : 38 : 594–619.**
A full account is given of the work of the Russian investigators and others on the South American potato species.

1506. Krantz, F. A. and
Tolaas, A. G. 633.491:575.247.061.6:575.255
The Red Warba potato.
Amer. Potato J. **1939 : 16 : 185–90.**
The potato variety Red Warba arose as a periclinal chimaera of the Warba variety, from which it differs in having tubers with a suffused red skin. Plants grown from the original mutant tuber bore tubers that had patches of undifferentiated periderm which bore neither buds nor lenticels. The proportion of these patches was later reduced by selecting against them within the clone.

1507. Bukasov, S. M. 633.491:576.16
The origin of potato species.
Physis, B. Aires **1939 : 18 : 41–46.**
The probable trend of evolution within the genus *Solanum* is discussed. The functioning of unreduced pollen of diploid species has probably given rise to autotriploids such as *S. Commersonii* and, possibly, *S. Millanii*. No tetraploids occur within or near the range of these species so that a hybrid origin is improbable. Triploid species of hybrid origin also occur in nature, among them being *S. vallis-mexici*, probably a hybrid between the diploid *S. verrucosum* and a tetraploid related to *S. Antipoviczii*. The cultivated triploids, *S. mamilliferum*, *S. tenuifilamentum*, *S. chocclo* and *S. cuencanum* and triploid *S. stenotomum* and *S. goniocalyx* all arose apparently from crosses between cultivated diploid species (*S. stenotomum*, *S. goniocalyx*, *S. cañarense*, etc.) and different *S. andigenum* varieties (tetraploids). *S. Juzepczukii* is a hybrid between two groups that are very difficult to cross, *Tuberosa* and *Acaulia*.
Tetraploids may have arisen from the fusion of 24-chromosome gametes formed on a triploid or by fusion of unreduced gametes of diploids. In either of these ways the *Andigena* tetraploids may have originated. In the case of the *Eu-tuberosa* group, a triploid (*S. maglia*) is known but no diploids. A similar situation holds for *Longipedicellata* which contains tetraploid *S. Antipoviczii* and triploid *S. vallis-mexici*. The groups *Oxycarpa* and *Acaulia*, which stand apart from the others, contain only tetraploids and their origin is unknown.
The origin of the two pentaploids, *S. semidemissum* and *S. curtilobum*, is not clear, but the latter probably originated from a cross involving an unreduced gamete of *S. Juzepczukii*

and a normal gamete of *S. andigenum*. *S. semidemissum* may be a hybrid between the hexaploid *S. demissum* and *S. Antipoviczii*.
Hexaploid *S. demissum* may have originated by chromosome doubling in *S. vallis-mexici* or a similar species.

1508. 633.491:576.16
MOLDENHAWER, K. 633.491:575(43.8)
Genealogia polskich odmian ziemniaków wpisanych do rejestru odmian oryginalnych. (**The genealogy of Polish potato varieties entered in the register of original varieties**).
Przegl. Doświad. Roln. (Rev. Agric. Res.) 1939 : **2** : 1–5.

A genealogical table of the Polish varieties and the chief foreign introductions is given, with indications of the wart reaction of the varieties. A brief outline of the history of potato breeding is also given, emphasis being placed on the limited nature of the initial material from which present-day varieties are derived. The Polish varieties are mainly descended from potatoes bred by H. Dołkowski, which in turn were produced principally from Paterson's Victoria and III Seed, Rough Purple Chili and Da Cuzco, Erste von Nassengrund and Zwikauer Frühe or Daber and Flourball. It is thought desirable to enlarge the range of parental material in future breeding work.

1509. KRANTZ, F. A.,
BECKER, C. L. and
FINEMAN, Z. M. 633.491:581.162.51:581.331.2:575.11
Incidence and inheritance of pollen sterility in the potato.
J. Agric. Res. 1939 : **58** : 593–601.

A study was made of fruit setting and pollen sterility in a large number of selfed lines of potato. Both, and particularly the former, were subject to a considerable amount of fluctuation due to environmental factors.
The inheritance of pollen sterility (as determined by the amount of stainable pollen) was studied in a cross between Lookout Mountain and an un-named variety, Accession 123. The results were explicable on the basis of a single pollen lethal gene with tetrasomic inheritance. Accession 123 may be denoted as *VVvv* and Lookout Mountain as *Vvvv*. It appears that under the particular environmental conditions of the experiment, about 65, 20 and 10 per cent respectively of the *VV*, *Vv* and *vv* pollen was viable.
The viability of the pollen in most of the plants of the above hybrid progeny was sufficient for seed-setting. It is considered that the high pollen sterility of many cultivated potato varieties is the result of selection and is not characteristic of the species as a whole. The presence of other characters such as restricted production of flowers and early abcission of flowers in cultivated potatoes suggests that selection for high yield has favoured the retention of genes adversely affecting sexual reproduction.

1510. 633.491:581.192
*PROKOŠEV, S. M. 633.491:575.127.2
(**Biochemistry of the potato**).
Biokhimia Kul'turnykh Rastenii (Biochemistry of Cultivated Plants) 1939 : **4** : 5–58.

The existing information on the chemical composition of the potato is reviewed. In *S. andigenum* the dry matter content is lower and varies less than in *S. tuberosum*. The starch content of *S. andigenum* is also lower. On the other hand the dry weight of some of the primitive and wild species is unusually high and it is probable that they have an equally high starch content. The protein content of some varieties of *S. andigenum* is also unusually high, some forms containing just double the protein of the highest domestic varieties. The same is true of many of the primitive and wild species. *S. andigenum* is found to have a much lower ratio of monosaccharides to saccharose, the average being 1·50 as compared with an average of 7·70 in domestic varieties; the tubers of *S. andigenum* are for this reason sweeter.

* An extended summary of this paper is on file at the Bureau.

No differences have been observed between the species as regards content of pentosans or in *p*H of tubers but *S. andigenum* and some of the tubers of the wild species have a distinctly higher buffer index.
The species vary widely in content of vitamin C, *S. Antipoviczii* being exceptionally high. Unusually high contents of glutathione have also been observed in some of the wild 24-chromosome species. Differences have been observed also in the temperature of coagulation of the protein and the properties of the starch grains in different varieties and species.
In outlining the new problems for potato breeders certain recommendations are given; e.g. crossing domestic varieties with *S. demissum*, *S. phureja* and possibly some races of *S. andigenum* for the production of potatoes with increased protein content. Analyses have been made of 276 hybrids of the most varied species with domestic varieties; most of the species were of the high protein group yet very few of the hybrids were materially higher than the domestic parent in protein content. High protein is therefore thought, contrary to the conclusions of Schwartz and Kuzmin (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1283, Vol. VII, Abst. 683), to be recessive.
Hybrids of wild species with domestic varieties often have a greatly increased dry matter content; some of the *S. demissum* hybrids are particularly interesting. In triple hybrids involving two crosses with domestic potato, where one of the domestic varieties was a late form (Downe Jan, Mathis) the dry matter content of the hybrid was extremely high. *S. demissum* is thought to be a very promising parent from this point of view.
Hybrids with *S. andigenum* were similar to the domestic parent in dry matter content and in the proportion of monosaccharides to saccharose.
Repeated back-crossing with domestic forms is often necessary to remove the bitter taste characteristic of many of the wild species.

1511. Haddock, J. L. and Blood, P. T. 633.491:581.6:578.08
Variations in cooking quality of potatoes as influenced by varieties.
Amer. Potato J. 1939 : **16** : 126–33.
It is concluded that the specific gravity of a sample of potatoes (as determined by flotation in salt solutions) is an excellent indicator of cooking quality. Owing to variation within samples, it is desirable that tests should be performed on a random sample of at least fifty and preferably a hundred tubers.

1512. Demidovič, A. F. 633.491–2.112–1.521.6:575
(Breeding potatoes for drought resistance).
Trudy Kazanskogo Sel'skokhozjaistvennogo Instituta (Trans. Kazan Agric. Inst.) 1938 : 139–73.
Sharp differences between varieties have been observed in time of sprouting, in rate of development of the sprouts, in the period from sprouting to tuber formation, in the amount of tubers formed during the period of haulm development and in the amount formed after the tops begin to wither. Pronounced differences in drought resistance have also been observed. Drought resistance seems to be associated with early tuber development—i.e. in the period while the haulms are still green—and with a vigorous root system.
Figures are given showing the rate of increase in tuber weight in the different periods for a number of varieties of varying type in wet and dry years. These again show the varieties to differ in respect of the periods in which they are most sensitive to drought. They differ also in response to manuring, vernalization and other cultural measures.
The results show that by suitable choice of varieties and agricultural operations it is possible to grow potatoes under conditions of considerable drought. Drought resistant seedlings have been obtained from the crosses (*S. demissum* x Fürstenkrone) x Alma, (*S. demissum* x Alma) x Granat, *S. Rybinii* x *S. stenotomum* and certain crosses between varieties of *S. tuberosum*, e.g. Imperator x Hindenburg No. 4858.
Some seedlings have been discarded on the score of susceptibility to virus, while others have displayed considerable resistance.

1513. Goffart, H. 633.491–2.6–1.521.6
Resistenzprüfung von Kartoffelsorten gegenüber *Heterodera schachtii* Schmidt. (**Tests of the resistance of potato varieties to *Heterodera schachtii* Schmidt**).
Züchter 1939 : **11** : 123–30.
A large number of potato varieties were tested for their resistance to nematodes by artificial inoculation and in field tests in infected soil and the results are tabulated. A few were resistant, due probably not to genetical factors for resistance but to the fact that they were late-ripening varieties.

1514. Allen, T. C. and
Rieman, G. H. 633.491–2.7–1.521.6:575(77.5)
Occurrence of hopperburn resistance and susceptibility in the potato.
Amer. Potato J. 1939 : **16** : 139–42.
A study was made of the resistance to "hopperburn" (injury caused by the potato leafhopper, *Empoasca fabae*, Huber.) of a number of new and old potato varieties and also of segregating seedling populations from 30 to 40 crosses. By selecting uninjured and injured plants from these populations it was possible to isolate clones showing a greater degree of resistance and of susceptibility than any of the commercial varieties tested. Further selections have been made for future study.

1515. Schwartz, M. and
Müller-Böhme, H. 633.491–2.7–1.521.6:575.127.2
Untersuchungen über die Kartoffelkäfer-Widerstandsfähigkeit von Kartoffelwildformen und von Kreuzungen solcher Wildformen mit Kulturformen. (**Investigations on the potato beetle resistance of wild forms of potatoes and of crosses of such wild forms with cultivated forms**).
Mitt. biol. Reichsanst. Landw. 1938 : Heft 58 : 47–54.
Complete immunity was observed in *Solanum demissum, S. polyadenium, S. Jamesii* and *S. chacoense* and a high degree of resistance in *S. Comersonii, S. verrucosum, S. acaule* and *S. chacoense* x Pepo F_1.
Marked resistance was recorded also in a number of the hybrids.

1516. Müller, K. O. 633.491–2.8–1.521.6:575
Über die Abbauresistenz der Kartoffel und die Züchtung abbaufester Kartoffelsorten. (**Resistance to degeneration in potatoes and the breeding of varieties free from degeneration**).
Z. Pflanzenz. 1939 : **23** : 1–19.
Observations at Dahlem, where potatoes are particularly subject to degeneration, show that the varieties differ in the degree in which their yields are reduced from year to year and also in their ultimate minimum yields. Two newly bred varieties 9233 and 9089 have given better yields in the tenth successive year of cultivation than those obtained from the best of the ordinary varieties in the fourth. The variety 9089 is the product of a cross of an Indian form from Chiloe with Dolkowski's variety Switez, the hybrid having been back-crossed with one of Broili's land races; the back-cross hybrid when selfed gave rise to 9089 among its seedlings. All the seedlings had 48 somatic chromosomes and undoubtedly belong to *Solanum tuberosum* (sensu stricto). Variety 9089 is much the more resistant of the two and has maintained its excellent performance when grown in other affected areas too, with the exception of certain plants that were attacked with Y virus, to which 9233 was entirely resistant. A high degree of tolerance to the leaf-roll virus was observed in 9089, and to mosaic both resistance and tolerance. The variety is however low in yield and has been crossed with a number of the best commercial varieties. The seedlings were grown for six successive years in Dahlem and some of the lines have proved distinctly superior to the most resistant cultivated varieties yet known.

Selfing 9089 and the variety Erdgold showed both to be heterozygous as regards resistance to leaf-roll and to stipple streak, resistance to each being inherited independently; as regards leaf-roll the selfed progeny of 9089 was much less attacked than that of Erdgold, while the hybrids between the two varieties were intermediate. Differences were observed in the time at which infection first occurred. The progenies of reciprocal hybrids were identical. The two characters resistance and tolerance were also inherited independently. The results of crossing showed that resistance to degeneration can be combined with mid-early maturity, wart resistance, good yield and tuber form, short stolons and resistance to blight biotype A. None of the hybrids with Erdgold excelled the 9089 parent in resistance, but some segregates occurred in the cross Ackersegen x 9089 which were more resistant than both parents, especially as regards resistance to the Y virus. A hybrid of Deodara x 9089 has been grown for 5 years without a single infection with stipple streak and in other hybrids there are indications of resistance to mosaic.

It is pointed out that many of the ancient land races are possessed of much higher virus resistance than the modern varieties and a collection of them is being established for breeding purposes. It is thought not impossible that forms possessed of true resistance to leaf-roll, as opposed to the tolerance of 9089, may yet be found.

1517. Richard, J. G. 633.492:575.247

The maintenance of seed stock of the Porto Rico sweet potato.

Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : p. 691.

Owing to the high rate of mutation in sweet potatoes it is considered that the skin and flesh colour of all seed potatoes should be checked.

Under field conditions an average of one visible mutation occurs in every 7,000 plants. Most of the mutations are retrogressive but occasionally they result in an improvement in type, an example being the mutation which gave rise to the strain Louisiana Porto Rico Unit One.

J. L. F.

1518. 633.492:581.162.3:578.08

Miller, J. C. 633.492:575(76.3)

Further studies and technic in sweet potato breeding in Louisiana.

Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 665–67.

Emasculation is performed between 5 and 6 a.m. and crossing between 8 and 10 a.m. on the same day, the day on which the flower is due to open. Isolation is effected by keeping the flower closed with a paper clip over the tip. Seed has to be treated for 20 minutes with concentrated sulphuric acid to ensure immediate germination.

The day-length requirements of different varieties are variable. Crosses made in the spring give in general a higher set than those made in the autumn. Fertility varies widely according to the variety.

The objects of the breeding work in Louisiana are a table variety of the Porto Rico type but more uniform in shape, with a high carotin content and uniform flesh colour throughout and also a high-yielding variety with a high starch content. Resistance to soil and stem rots is desirable in both these types.

J. L. F.

FIBRES 633.5

1519. Waelkens, M. 633.51:575.42(67.5)

La sélection pédigrée à Bambesa pendant la période 1934–1938. (**Pedigree selection at Bambesa during the period 1934-1938**).

Bull. Com. Coton. Cong. 1939 : **4** : 3–10.

The first stage in the cotton breeding programme, the substitution of the old mass selections by pure pedigree seed, has now been accomplished. The selections 145.C.55 and 270.D.64 have yielded 10 to 30 per cent more than the old standards and are superior also in quality. Their minimum staple length is 15/16″ full, the modal value being 31/32″, values of 1″ to 1 1/32″ being not infrequent. Excellent reports have been received from the trader and Fam. 145 has been pronounced equal to the American cotton S.M.1.

1520. 633.51:575.42:575.14(49·5)
CHRISTIDIS, B. G. 633.51.00.14(49.5)
(Variety trials carried out by the Greek Cotton Institute during the years 1932-37).
Publ. Inst. Cott., Serv. Etudes Agron. Econ., Minist. Agric., Athènes 1938 : Pp. 34.

Variety trials involving American and Egyptian types are described.
About 60 years ago, varieties of American Upland cottons were imported into Greece and have since been grown as a mixture. Considerable adaptation has occurred to the short season and droughty conditions of the country and selection and inbreeding within this mixture has led to the production of valuable types. Outstanding among these are the following:
6x17. Typical colour of stems and leaves (light-green or milky-green) with an enormous amount of fruit of exceptional earliness. Lint length $1\frac{1}{16}$ inch and ginning out-turn 32 per cent. In most of the experiments in southern Greece this selection was almost without competitors.
6x5. Like the previous one with longer staple and a higher lint percentage.
9x5. Remarkable chiefly for the quality of its lint. Staple length amounting fully to $1\frac{1}{8}$ inch, ginning out-turn 35 per cent and a good yield to the acre. A sister selection *9x8* produces lint of exceptional quality, lustrous, strong and about $1\frac{1}{4}$ inch in length.
12x8. Very early variety with slightly reddish colour of stems and leaves. This selection germinated early and almost under any weather conditions, giving a very high yield to the acre (second to none in this respect). Ginning out-turn amounts to 31·5 per cent, reaching 35 per cent under favourable conditions, while the lint length varies between 15/16 and 1 inch.
13x5B. Early selection with high yield per acre and a lint percentage of about 37·5. Lint length in some of its derivatives amounts to $1\frac{1}{8}$ inch.
14x6. Not so early as the other types and rather sensitive to bad weather conditions at the time of germination. This is a short staple selection, highly productive, with an exceptional ginning out-turn, amounting to 39 to 40 per cent, a figure never reached so far with any of the other foreign or local varieties tested.
16x3. Very early and drought resistant, affected by excessive moisture. Fructification of cluster type. Lint percentage 32 to 33 and lint length one inch.
21x5. Shape of plants pyramidal. An exceptional amount of fruit scattered all over the plant. Ginning out-turn 36 per cent and lint length well over 1 inch.
29x2. Extremely hardy under all sorts of unfavourable circumstances (drought, moisture, winds, diseases, soil fertility, etc.). High yield per acre, with a very short staple (hardly 14/16 of an inch) and lint percentage not exceeding 31 to 32.
Seed of these forms self-fertilized for only two years has been distributed to farmers. Stocks selfed for a longer period are now being raised.

1521. MALYKH, P. V. 633.52:575(47)
(New lines of flax for fibre).
Len i Konoplja (Flax and Hemp) 1939 : No. 4 : 30–34.

The desiderata in breeding flax for fibre are stated and details are given of the origin, characteristics and performance of the following new varieties that have been undergoing trials in the U.S.S.R., U–1, U–2 and U–3, 651–3–1 and two new strains recently selected from the last named line.

1522. POPEREKOV, M. F. 633.52:575(47)
(Pedigree flax in the third 5-year plan).
Len i Konoplja (Flax and Hemp) 1939 : No. 4 : 10–13.

Propaganda is presented in favour of seed selection and the supply and use of high grade and rust resistant varieties in increasing the yields of flax for seed in the U.S.S.R. Similar measures should be adopted in linseed production.

1523. Griško, N. N.,
Pančenko, P. F. and
Maluša, K. V. (Editors). 633.522:575
(Genetics and breeding of hemp).
Vsesojuznyi Naučno-Issledovatel'skii Institut Konopli, Trudy (State Hemp Research Institute, Transactions) Moscow and Leningrad 1937 : No. 5 : Pp. 286.

The monograph contains the following articles:—

Griško, N. N. and Grečukhin, E. I. (*Floral biology and methods of isolation and hybridization of hemp*). (*pp. 5–25*).

The course of flowering in the male and female plants is described. By pollinating bagged flowers at varying intervals after the opening of the flowers it was found that 20–30 days after the beginning of flowering is the most successful period. The best artificial medium for germinating pollen was found to be a mixture of a 3·75 per cent glucose solution with a 1 per cent agar solution in the proportions of 3 : 2; fresh pollen gave an 80–90 per cent germination, 2–3 days old pollen much less (8·4 to 14·2 per cent on the third day); on the fourth and later days there was no germination, unless the pollen was preserved in a moist chamber, when some germination was obtained up to the eighth and ninth day.
The pollen was observed to be carried by wind to a distance of up to 5 km.
The various ways of carrying out hybridization are described; different strains of hemp are found to require isolating at different times, southern forms where the female flowers earlier than the male requiring earlier isolation than the northern forms. Pollination is effective only after the appearance of the stigmata; it can be performed either with pollen collected from the male inflorescences or by introducing these into the isolator. The most efficient isolators were those of glued parchment.

Lebedev, S. I. and Levčenko, V. I. [*Phasic development of hemp* (*preliminary communication*)]. (*pp. 26–43*).

Pukh, E. I. [*Cytological and morphological investigation of hemp* (*Cannabis sativa L.*)] (*pp. 44–56*).

The development of microspore and macrospore mother cells is described from the embryological and karyological viewpoints. The number of bivalents observed at diakinesis was as a rule 10, though 11 were observed in the monoecious form and in certain other forms there were higher numbers up to 15, certain meiotic irregularities also being observed.
The development of the embryo sac, the process of fertilization and the formation of the embryo are described. One case of supposed parthenogenesis is reported.

Medvedeva, G. B. (*Microsporogenesis of Italian hemp*). (*pp. 57–64*).

Italian hemp grown in the neighbourhood of Moscow showed a tendency to form tetraploid and hyper- and hypo-diploid nuclei in the archesporial tissue, and a tendency towards failure of conjugation and attendant irregularities of division and of tetrad formation. No such irregularities were observed in the same hemp grown in Abkhasia and they are thought therefore to be the result of unfavourable growth conditions.

Driga, I. E. [*Cytological investigation of hemp* (*preliminary communication*)]. (*pp. 65–72*).

The diploid number 20 was confirmed in all races of *Cannabis sativus* investigated. The morphological characteristics distinguishing the different chromosomes are described and illustrated.
Tetraploid cells have been observed in the primary cortex of the root growing point, which suggests the possibility of obtaining polyploid shoots.
Heteromorphic chromosomes were observed in male plants and are presumed to be connected with sex determination.

Griško, N. N., Levčenko, V. I. and Seletskii, V. I. (*Question of sex in hemp, the production of monoecious forms and of varieties with simultaneous ripening of both sexes*). (*pp. 73–108*).

The existing information on sex in hemp is briefly reviewed. Monoecious forms have been

found in hemps from nearly every part of the world and also in the results of crossing; both feminized male plants and masculinized female plants occur; from these it has been possible to produce forms with simultaneous ripening of the male and female flowers. Considerable variation in the degree of intersexuality has been observed and the different types are described. The monoecious plants were perfectly normal in habit and some even had longer stems than the normal plants of the same family. The percentage fibre content was found to be less than the normal male plants but greater than the female.

Levčenko, V. I. (*Changes in the morphology of the flower under the influence of short-day and traumatic actions*). (*pp. 109–24*).

Both short-day treatment and wounding call forth a tendency in the flowers of both sexes to become hermaphrodite.

Grečukhin, E. [*Investigation of heterosis in hemp* (*preliminary communication*)]. (*pp. 125–39*).

F_1 hybrids between Italian and Caucasian hemp were obtained by planting together and removing the male plants of the former; a yield increase of 7·6 per cent over the average of the parents was obtained at one station, 1·7 per cent and 1·3 per cent at others whilst at one station a decrease of 4·1 per cent was observed. Time of flowering was hastened by up to 7·5 days as compared with the average of the two parents, some forms being 4 days earlier than the early parent. Growth measurements showed that in the early stages the hybrid plants were more vigorous than the parents; the young hybrids were sometimes twice the height; towards maturity these differences became less marked and the hybrids were about as tall as the taller parent or a little taller. This catching up occurred earlier in some parental combinations than in others.

The most pronounced heterosis was observed in the cross Nevinnomysskaja x Japanese where the female plants were 52·8 cm. (26·5 per cent) taller than the average of the parents and 36·3 cm. (12·2 per cent) higher than the taller parent; in this cross the male plants showed no heterosis. In all combinations the degree of heterosis observed varied with the conditions of cultivation. Crosses of oriental races with southern forms tended to give the most pronounced heterosis.

Griško, N. N. [*Work on the experimental production of initial material for breeding in hemp* (*preliminary communication*)]. (*pp. 140–52*).

Germinating seeds of hemp were found to be capable of tolerating X-ray doses of 4,000 to 8,000 r., some races even higher doses up to 16,000 r. The X-rayed progeny contained various chlorophyll mutations and structural anomalies, many of which are described.

Flower buds and flowers shortly after pollination were also irradiated. Various anomalous forms appeared in the progeny, including a masculinized female plant which produced about 30 per cent of monoecious plants in its progeny.

It is thought possible to obtain by this method also plants in which a lethal chlorophyll deficiency is linked with male sex, whereby a form consisting almost exclusively of female plants would result.

Similar results were produced by biontization followed by centrifuging; centrifuging alone was less efficacious.

Kaniskin, M. F. (*Wild hemp*). (*pp. 153–61*).

Wild hemp has been found growing in arid places where scarcely any other plants will survive. The wild hemp is early maturing and very vigorous; for this reason is to be used in crossing with the hemp of southern Russia, which fails to ripen in the north. A great variety of types was observed.

Makarevič, V. A. (*Anatomical characteristics of different varieties of hemp*). (*pp. 162–91*).

The stem diameter, area of the transverse section, area of the bast, of the wood and of the fibres, number of fibres and their diameter were measured in a number of different forms of hemp; observations were also made on the morphological characteristics of the stem in general,

on the disposition of the vascular bundles, their form, the form of the fibres and of their internal canal and the character of the angles of the fibre.
The proportion of the stem section occupied by fibres was greatest in wild hemp, which contained also a lower proportion of woody tissue; the percentage fibre content was consequently highest in the wild hemp. The form of the fibres varied in the different varieties, and also the percentage fibre content and proportion of primary fibres.
The central portion of the stem was found to be the best for judging fibre qualities in breeding work

Griško, N. N. (*Selection based on direct and indirect characters in hemp. The coefficients of variation and correlation of selection characters in hemp*). (*pp. 192–208*).

Figures are given showing the variation in a number of characters supposed to be of value in judging quality. The least variable character was total stem length, which was highly correlated positively with "technical length", weight of straw and with weight of fibre; it was also correlated with diameter at the middle of the stem and with number of internodes; with percentage of fibre it was negatively correlated. Stem weight was the most variable character; it was positively correlated with total length, diameter, and fibre weight. Number of internodes was positively correlated with weight of fibre, negatively with fibre percentage. The relation between the length to the inflorescence and diameter at the middle of the stem was positively correlated with fibre percentage and negatively with weight of fibre.
Breeders are recommended to select the plants with the highest fibre percentage, a light thin stem producing a high weight of fibres being the type aimed at.

Maluša, K. V. (*Investigation on the density of stand in hemp breeding nurseries*). (*pp. 209–23*).

Observations were made upon plants grown at different spacings and the closer spacings were found to give on the whole lower coefficients of variation and higher coefficients of correlation. A spacing of approximately 12 x 5 cm. is found to be the most suitable for breeding plots.

Maluša, K. V. [*Hemp breeding.* (*Some results of the work of 1931–1934*)]. (*pp. 224–79*).

The large number of locally adapted land races of hemp known to exist have been shown to differ clearly in yield of fibre and of seed, the southern forms being generally higher in fibre yield and the northern forms in seed yield. Figures are given showing that the southern forms are more efficient in their utilization of manurial elements in the soil, their root system being also better developed. These southern forms are thus regarded as the most promising for crossing.
Different forms varied greatly in reaction to *Orobanche ramosa*, some being quite immune. No difference has been observed in resistance to the cornborer but certain races resistant to the flea beetle have been observed. Differences were noted also in reaction to low temperature and a number of other factors.
The various methods of hemp breeding employed are described in detail, with indications of the main characters for which to select, namely total stem length, diameter at the middle of the stem, compact inflorescence, branching, freedom from disease and pests, weight of plant, of fibre and of seeds, percentage and quality of fibre, time of maturity, and proportion of male plants. The methods described include mass selection, individual family selection, group family selection, in which the same variety serves as male parent for all generations and all families, hybridization and inbreeding. Precise directions are given for the estimation of the various characters used.
Mass selection in the oil-fibre type has led to increases of as much as 11 per cent in yield of straw in some strains whilst in others it has had no effect. Selected strains have shown a lower proportion of losses in the female plants but in other characters no effect has been observed. Individual family selection has had somewhat more positive results. It is too early yet to judge the success of the other methods.
In southern varieties for seed production a considerable increase in earliness has been attained by mass selection, with the result that they will produce mature seed in central Russia; the

early forms are somewhat lower in fibre yield but much superior in yield of seed. Increased earliness has been attained also by individual plant selection, the vegetation period having been reduced from 132 days in the initial populations to 111 days in the best selections. These selections were superior also in many other characters.
Hybridizations have been made by planting several varieties in juxtaposition and removing the male plants from all but one, which serves as the male parent. Some of the crosses of southern forms (Italian, etc.) with the local hemp are showing distinct promise in respect of earliness of maturity combined with length and diameter of stem and other characters. Distinct improvement has been effected in the purely fibre type by means of selection.

Dewey, L. P. (*Hemp breeding in America*). (*pp. 280–86*).
The methods of hemp breeding employed in the U.S.A. are outlined and the production of the variety Kymington by selection from Minnesota No. 8 is described. Crosses of this variety with the selection Chington have produced a new promising variety Chinamington. Various other crosses have also been made. From Kymington x Ferrara hemp an early maturing type Ferramington has been produced.
A simple-leaved form obtained from the last-named cross has proved inferior in fibre quality.

1524. Rumjantsev, A. Kh. 633.522:577.86:581.6
(Fibre quality of simultaneous ripening hemp).
Len i Konoplja (Flax and Hemp) 1939 : No. 6 : 46–47.
The new hemp in which the male and female plants ripen simultaneously can be harvested mechanically and has excelled the common forms by 30–50 per cent in yield. Data are given for fibre quality, showing it to be equal to that of the ordinary Central Russian hemps, the strength being distinctly greater.

SUGAR PLANTS 633.6

1525. Arceneaux, G. 633.61:519.24:631.421
Report of the committee on technique of field experiments.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 387–90.
Experiments in Hawaii indicated that in sugar cane trials there was no loss of accuracy when a systematic arrangement of plots was used instead of a random one. A restricted random arrangement appears to be the best, however. In Louisiana it was found that a Latin square arrangement gave a significant increase in accuracy over a purely random one in nearly every case.
A larger size of plot is usually used in experiments with sugar cane than with most other crops. The reasons for this are discussed. When a motor operated cane weigher is used in Louisiana, 1/40 acre plots have proved satisfactory. In Hawaii, plots 4 to 8 times that size are preferred.
Border effect is serious in cane trials where there are great differences in vigour between adjacent varieties. It is found that a correction for this disturbance may be made mathematically (Cf. Abst. 1526).
In cases where plot samples are taken, it has been shown in Louisiana that a three-stalk sample from each plot is enough for the estimation of the yield of sugar per ton of cane but a 10 to 20-stalk sample is required for estimates of cane yield.
Attention is directed to the necessity for conducting trials at several stations for several years in order to obtain a reliable estimate of a new variety.

1526. Arceneaux, G.,
Stokes, I. E.,
Belcher, B. A. and
Gibbens, R. T. (Jr). 633.61:519.24:631.421(73)
Border competition in sugarcane variety tests under Louisiana and Georgia conditions.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 403–20.
"Border effect" in sugar-cane trials in Louisiana and Georgia was found to be important in

cases where adjacent plots were of varieties of widely differing vigour. The effect was to exaggerate the yield of the vigorous varieties and to depress the yield of the weaker ones. It is difficult, owing to the nature of the crop, to discard the outside rows of each plot in the case of sugar cane. A series of regression coefficients that enable the disturbance in varietal yield due to competition to be compensated for was therefore calculated, and the use of these coefficients is illustrated.

1527. YAMASAKI, M. 633.61:575(52)
(Breeding a new sugar cane variety F 108).
Jap. J. Genet. 1938 : **14** : 300–02.
After a brief historical note on sugar cane cultivation in Formosa from the period of the thin cane up to that of the large stemmed Javanese varieties, the new variety F 108 and its pedigree are described. It is superior to POJ 2725 in sugar content, rapidity of growth and strength of its stem which has a large number of fibres, thus conducing to wind resistance.
The chromosome number of F 108 has been determined as $2n = 109$ approximately while the somatic chromosomes of its male parent F 46 numbered 122 and of its female parent 2725 POJ, 107.

1528. SORNAY, A. DE 633.61:575(69.82)
Seedling selection in Mauritius.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 718–26.
A brief account is given of the sugar cane breeding work in progress in Mauritius and of the experimental technique used. More detailed summaries of this work have appeared from time to time in "Plant Breeding Abstracts", (Cf. Vol. IX, Abst. 607).

1529. 633.61:575(91.4)
CABANOS, J. B. 575:633(91.4)
The Granja sugar cane experiment station.
Philipp. J. Agric. 1939 : **10** : 35–68.
An account is given of the work done at the Station, which has recently passed into private hands. With regard to sugar cane, introductions and trials of foreign and local varieties were carried out and breeding work was also done. The most notable achievement was the production of the cane L.C. 25/191 (Alunan) from the cross Java 247 x Badila. This is now one of the chief canes in the province of Negros. Many new seedlings were under test when the station was transferred, some of them very promising.
Of late years the Station has sponsored a crop diversification scheme, in the course of which it has conducted trials of a variety of crops and distributed improved selections of many of them.

1530. 633.61:575(94.4)
NORTH, D. S. 633.61–2–1.521.6:578.08
Sugarcane improvement work in New South Wales.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 79–88.
Sugar-cane breeding work in New South Wales is conducted under the auspices of the Colonial Sugar Refining Company, Ltd., with some co-operation from the New South Wales Department of Agriculture. Two major objectives are in view; to produce a good cane for biennial harvesting that is resistant to Fiji disease and the other cane diseases prevalent in New South Wales and to produce an annual cane for growing in areas particularly subject to winter frosts. Owing to the fact that sugar cane rarely arrows in New South Wales, the actual crossing is done for the most part at Macknade, North Queensland.
With regard to biennial canes, the most promising varieties for use as parents have proved to be Kassoer derivatives, notably P.O.J. 2364 and P.O.J. 2878. Pollen parents have included various noble canes, but M.Q. (Macknade, Queensland) seedlings involving Kassoer as a parent are favoured.
The Department of Agriculture has grown fuzz sent from most of the important sugar-cane breeding stations of the world, but the results have been very disappointing. The most

notable seedlings were obtained from the cross P.O.J. 2725 x Q.813 and from P.O.J. 2878 selfed—facts which suggest that the best varieties for use as parents at Macknade have already been selected.
The variety testing technique in use is described. With regard to disease resistance, reliance is placed on natural infection in plots interplanted with susceptible but tolerant varieties. The infector varieties used include Kassoer for Fiji disease and Mahona for leaf scald. In the case of mosaic, sorghum is planted as a host for the insect vector and an infected cane variety is planted so that it comes up a little earlier than the varieties to be tested.
The programme for breeding annual canes is as yet not very far advanced. So far only crosses between noble canes have given promise in this respect.

1531. Sornay, A. de 633.61:575:578.08
Brief description of a crossing-lantern used by the sugarcane research station, Mauritius.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 170–71.
The new type of lantern is smaller and lighter than the type previously used. A photograph of it appears in the text.

1532. Nakamura, M. 633.61:575.127.5:633.174:581.143.32
(Some examples of abnormalities occurring in hybrids *Saccharum officinarum* x *Andropogon sorghum*).
J. Soc. Trop. Agric., Taiwan 1937 : 9 : 256–61.
Various abnormalities were observed in seedling progenies of the cross *Saccharum officinarum* (P.O.J. 2725) x sorghum (Morokoshi). Dwarf plants occurred to the extent of 60–70 per cent of the total, but the actual percentage varied from approximately 80 per cent to as low as 38 per cent in different crossings. The percentage also varied with the year in which the cross were made. The author considers that this variation may be due to an effect of temperature or other environmental conditions on chromosome distribution at meiosis in the sugar cane. A plant that produced an ear when only 30 cm. high is illustrated. Such plants are male and female sterile.
Ears were produced on lateral tillers in some of the hybrids, a characteristic derived from the sorghum parent. The spikelets of the hybrids on the whole resembled those of sugar cane in form, but sometimes they were dichotomous or nearly so.
Plants without buds at the nodes occurred among the hybrids.

1533. Venkatraman, T. S. 633.61:575.127.5:633.289(54.8)
Cane hybridization work in Coimbatore.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 731–32.
Among many thousands of sugar cane seedlings which had the variety P.O.J.213 as a parent, no segregates were obtained that resembled either Black Cheribon or Chunnee, which were the parents of P.O.J.213. In the F_2 of a cross between P.O.J.213 and bamboo, however, types very similar to both Cheribon and Chunnee were obtained.
The F_2 sugar cane x bamboo plants raised at Coimbatore show various combinations of the parental characters. Many of them are of excellent habit and preliminary refractometer readings of some of them have been encouraging. Although some plants are quite hard, there were others that are quite soft enough for most mills.

1534. Bell, A. F. 633.61:575.42:578.08:631.421(94.3)
The selection of second year seedlings.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 710–14.
Under Queensland conditions it is shown that differences in yield of the order of 20 per cent are the smallest that can be detected when 40 setts of each seedling sugar cane variety are planted. It is therefore concluded that the normal procedure of making second year selections on the basis of plots of 6–10 setts is quite unsatisfactory. It is proposed that a single plot

of four ten-sett rows of each seedling should be grown for second year selection and that about 15 per cent of the experimental area should be planted to a standard variety. Selections would then be made on the basis of visual comparison of seedlings with adjacent control plots. In order to minimize inter-plot competition it is suggested that single rows of a tall variety of erect growth habit should be grown between the columns of plots. The variety P.O.J.234 has been used in this way with encouraging results.

1535. Lauritzen, J. I.,
Balch, R. T. and
Fort, C. A. 633.61–1.521.6:581.198
Resistance to inversion of sucrose in harvested sugarcane in Louisiana.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 809–19.

There are marked differences in varietal resistance to inversion of sucrose and preliminary data suggest that such resistance may be inherited. Many seedlings of the parentage P.O.J.2725 x C.P.1165 are resistant, some of them highly so, and one of the parents of this cross, P.O.J.2725, is itself highly resistant.

The effects of various environmental conditions that may influence the amount of inversion of sucrose in cut cane are discussed.

1536. Brandes, E. W.,
Sartoris, G. B. and 633.61–1.524:575
Grassl, C. O. 633.61:576.16
Assembling and evaluating wild forms of sugarcane and closely related plants.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 128–54.

The wild forms of sugar-cane and *Erianthus* collected by the U.S. Department of Agriculture are briefly described and the chromosome numbers of many of them are reported. It is considered that the wild species *Saccharum robustum* and a species of *Erianthus* have contributed to the ancestry of cultivated *S. officinarum.*

Some of the wild forms of *Saccharum* may be immune to mosaic, and all are highly resistant or show negligible injury. The type variety of *S. robustum*, N.G.251, appears to be susceptible. Wild canes collected from the Amu Darya river in Turkmenistan are winter-hardy when grown at Arlington, Virginia. Successful crosses involving these forms have recently been made.

1537. 633.61–2.3–1.521.6:578.08
Stevenson, G. C. 633.61:575.127.2
Breeding and testing sugarcane seedlings for gumming disease resistance at the British West Indies Central Sugar Cane Breeding Station, Barbados.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 75–78.

Resistance to gumming disease (*Bacterium vascularum*) is determined at the Station by observing the intensity of leaf symptoms of seedlings under conditions of natural infection. It has been found that varieties that are susceptible to systemic infection with the disease invariably show severe leaf symptoms. Some other varieties that show severe leaf symptoms, however, do not show gum exudation from the stem; they are classed as susceptible but tolerant to the disease. One of the latter tolerant varieties is the previously widely grown cane Ba.11569. This is now interplanted in the testing nursery as a source of infection, at the same time serving as a standard of comparison.

Data are presented relating to the proportion of resistant plants obtained from various crosses. Within the noble canes the proportion of such plants varied directly with the resistance of the male parent when Ba. 11569 was used as the female. A very high proportion of resistant types was obtained from crosses involving *Saccharum spontaneum* and *S. Barberi* and even the fourth and fifth nobilizations of glagah contained 96 to 100 per cent of resistant plants.

1538. Abbott, E. V. 633.61–2.482–1.521.6:575(76.3)
Cytospora rot of sugarcane in Louisiana.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 447–57.

The relative resistance of a number of sugar-cane varieties to *Cytospora* rot is recorded and the relation of the disease to the seedling testing programme of the United States Department of Agriculture is discussed. So far no promising seedlings have had to be eliminated solely because of susceptibility to it.

The incidence of the sheath rot phase of the disease in various selections of the 1928 to 1934 series of C.P. seedlings and in several complete progenies is summarized. The progeny of the cross U.S. 1643 (susceptible) x C.P. 29/284 (resistant) was notable for its high resistance. The progeny of the cross Co.281 (susceptible) ♀ x P.O.J. 2878 (resistant) ♂ showed no greater resistance than that of the same female parent crossed with U.S. 1694, a very susceptible form.

In Louisiana only some hybrids of complex ancestry have so far shown themselves to be notably susceptible to *Cytospora* rot. The noble canes are resistant and only slight infection has been noted on varieties of *Saccharum Barberi, S. sinense* and *S. spontaneum.*

1539. Yamasaki, M. and
Arikado, H. 633.61–2.7–1.521.6
The cell-sap concentration of sugarcane varieties in relation to their resistance to the attack of the white leaf louse.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 475–78.

It was found that sugar-cane varieties with a low cell sap concentration in the leaves (below a critical concentration of about 4·5 Brix) showed resistance to the white leaf louse (*Ceratovacuna lanigera* Z.) in Formosa.

1540. Mathes, R.,
Ingram, J. W. and
Haley, W. E. 633.61–2.7–1.521.6:575(76.3)
Preliminary report on studies of progenies of sugarcane crosses for susceptibility to sugarcane borer injury in Louisiana.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 581–89.

The progenies of 27 crosses of sugar cane were tested for their resistance to the sugar cane borer, *Diatraea saccharalis.* Only three of these progenies, P.O.J.2725 x Co.214, C.P.29/133 x C.P.29/290 and Co.281 x N.G.251, were significantly less attacked than the average, the degree of significance being greatest in the third cross. The marked resistance of this cross must have been obtained from the N.G.251 parent (a recent introduction of *Saccharum robustum* from New Guinea) since other crosses involving Co.281 showed an average amount of borer damage.

A study was made of the correlations between borer damage and various morphological characters of the host plant. The percentage of joints bored varied directly with the diameter of the stalk and inversely with the plant height. White and pink stalks were infested less than green ones. There was no relation between borer infestation and leaf width.

1541. Sorenson, H. 633.61–2.8–1.521.6:575(72.91)
The behavior of mosaic on certain soils and mosaic in regard to cane breeding.
Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 357–60.

It is concluded, on the basis of experiments conducted in Cuba, that resistance to mosaic may be determined by the ability of resistant plants to absorb small amounts of certain heavy metals and other rarer elements even in the presence of a catalytic inoculum which renders susceptible plants unable to absorb enough of them. Small applications of a mixture of Mn, Cu, Zn, Pb, B, I and Cr enabled infested stools of medium resistant varieties to recover from the disease.

From the point of view of the breeder, it is considered that susceptible x susceptible crosses need not necessarily produce a high percentage of susceptible seedlings. In order to test this possibility several thousand hybrid seedlings are being raised.

1542. 633.61–2.8–1.521.6:578.08

Stevenson, G. C. 633.61:575(72.98)

Breeding and testing sugarcane seedlings for mosaic disease resistance at the British West Indies Central Sugar Cane Breeding Station, Barbados.

Proc. 6th Congr. Int. Soc. Sug. Cane Tech., La (1938) 1939 : 71–75.

New sugar cane seedlings are now tested at the Station by growing them in six-stool rows interplanted with rows of canes grown from cuttings infected with the disease. Rows of maize are also included to attract the insect vector, *Aphis maidis*. Various nobilizations of glagah, Chunnee and Uba are under test.

The results of a comparative test of four methods of artificially infecting sugar cane with mosaic disease are recorded. The most successful was the Sein leaf slip method, which consists of wrapping a strip of diseased leaf about six inches long and one inch wide tightly around the unrolled central leaf spindle of the shoot to be inoculated and then pushing a bunch of very fine pins through the infected tissue into the tissue below. By this method 44 per cent of successful inoculations were obtained.

1543. Busanov, I. F. 633.63:575(47)

(To give still more valuable varieties of sugar beet to our country).

Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1938 : **15** : Nos 3–4 : 5–11.

Government prizes have been awarded to the breeders who have produced the best new varieties of sugar beet. Of those produced in 1938, 22 have been classed as outstanding, the best of them having had a sugar content of around 17 per cent and yielded between 55 and 56 centners of sugar per hectare. Differences between varieties are more clearly expressed under intensive conditions of cultivation, which should therefore be used as much as possible in breeding nurseries. Under intensive conditions much higher yields of sugar have been obtained. The characteristics of the best of the new varieties are described, with indications of the regions for which they are suited. The best have given yields of 80 and up to 90 c. sugar per ha.; e.g. No. 1305 of the Ivanovo station gave 80·2 c. per ha. sugar, having yielded 481 c. per ha. of roots with a sugar content of 18·6 per cent.

Distinct progress has been made in the production of forms combining high yield and high sugar content, which are gradually being grown to the exclusion of other types. Efforts are also being made to produce forms free from bolting and resistant to disease.

1544. 633.63:575.127.2:633.41

Zosimovič, V. P. 633.63–2.484–1.521.6:575(47)

(New hybrids between wild and sugar beet, that are resistant to *Cercospora*).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 1 : 12–16.

In a sugar beet—wild beet (ssp. *maritima*) cross, the third generation progeny obtained from the F_1 back-crossed twice, the F_2 back-crossed once and the F_1 back-cross selfed or interbred, showed that a sufficiently "cultivated" type could be obtained and that the yield even under conditions of severe infection with *Cercospora* might exceed that of high yielding types of beet. In the wild beet apparently "fanged" roots were conditioned by at least two pairs of polymeric dominants and, in the cross under discussion, the defect can probably be eliminated. In the F_3 most of the roots did not exhibit the defect and the degree of lignification of the root in high yielding forms scarcely differed from that of the sugar beet. Plants selected for immunity to *Cercospora* had a high root weight. The F_3 in some cases surpassed the sugar beet in sugar content. Bolting did not occur among the hybrids owing, it is asserted, to the fact that the southern European wild beet has undergone natural selection under conditions involving a long vernalization stage and a rather long day.

1545. Colin, H. and Bougy, E. 633.63:575.127.2:633.416
Les croisements de sucrières et de fourragères. Dissociation, en F_2, de l'hybride Kuhn x Mangold. (**Crosses of sugar beets and forage beets. Segregation, in F_2, of the hybrid Kuhn x Mangold**).
Publ. Inst. Belge Amélior. Better. 1939 : **7** : 28–47.

The results obtained in the F_1 of this cross between the sugar beet, Kuhn, and the forage beet, a globe variety of Sutton's mangold, have already been published (Cf. Vol. IX, Abst. 1125). To obtain the F_2, seed was taken from one plant from the cross Kuhn x Mangold with a small orange root and low sugar content. The F_2 consisted of 20 per cent with white roots, 34·2 per cent with yellow and 45·6 per cent with red. The average weight of the roots (root and crown) was intermediate between that of the parents as was also the refractive index.
The product of the sugar content of the juice (according to the refractive index) and the average weight of the roots was 99·7 for the red-rooted hybrids, 87·7 for the yellow and 76·5 for the white. That for Kuhn was 90.5 and for Mangold 72·7. The weight of the foliage, relative to the root, was intermediate between that of the parents.
The dominant form is that of a less globular Mangold but all intermediate forms are present between an elongated sugar beet and a top-shaped forage beet.
In this cross a great variety of forms is available for selection and it is possible that after several generations a very superior form may result.

1546. Sobrinho, V. 633.682:575.252
Considerações geraes sobre o genero *Manihot*. (**General considerations on the genus *Manihot***).
Bol. Sec. Agric. Industr. Com. Pernambuco 1939 : **4** : 54–58.

The genus, species and their varieties are described. *M. utilissima* is less cultivated now than *M. dulcis* var. *aipi* Pax.; the latter species being propagated vegetatively it is probable that many of its forms are bud mutants and attention is called to the necessity for their detailed investigation.

1547. Boiteau, P. 633.682:576.312.35
Caryologie du manioc cultivé, *Manihot utilissima* Pohl. (**Karyology of cultivated cassava, *M. utilissima* Pohl.**).
Bull. Acad. Malgache 1937 : **20** : 117–18.

All varieties examined were diploid, with $2n = 4$. At mitosis the chromosomes enlarge at the expense of the nucleolus, with which they appear to be intimately related.

STIMULANTS 633.7

1548. Koenig, P. 633.71:575(43)
Über die Entwicklung der deutschen Tabakzüchtung. (**On the development of German tobacco breeding**).
Forsch. Fortschr. dtsch. Wiss. 1938 : **14** : 358–59.

Koenig, P.
Fortschritte in der deutschen Tabakzüchtung. (**Progress in the German tobacco cultivation**).
Tabak 1938 : **2** : Heft 2 : Pp. 12.

After a brief historical introduction, the author describes the aims and scope of present-day breeding work at the Forchheim Institute. This includes breeding work on various types of tobacco, the characters which form the basis of selection in each case being described. It also includes the breeding of nicotine-free tobaccos and those with very low and very high nicotine content; breeding for resistance to wildfire, streak, mosaic and other virus diseases as well as to drought, and breeding types with or without petiole.
Disease resistance is being sought by inoculation, selection and hybridization. The varieties Amersfoorter I/S, Uckermärker Spitzblatt, Kentucky Geudertheimer, FO, FD and FC are

among those resistant to wildfire (*Pseudomonas tabaci*); the first of these has been widely used in crosses, while the last three were bred at Forchheim. Resistance to the virus disease "Mauke" is found in FC, FS and other forms. FC and the cigarette tobaccos are resistant to drought. Some degree of resistance to hail is being obtained by selecting forms in which the leaves are borne at a steep angle rather than horizontally.
A very large collection of tobacco forms and species is maintained at the Institute and forms the basis of cytogenetic studies.

1549. Cieślicki, Z. 633.71:575(43.8)
Przegląd doświadczeń rejonowych z tytoniem, przeprowadzonych w małopolskich okręgach uprawy tytoniu w r. 1937. **(Survey of regional experiments with tobacco carried out in the Małopolska zones of tobacco cultivation in 1937).**
Przegl. Uprawy Tytoniu 1938 : **5** : 49–51.
In the variety Tyk-Kułak the best yield and quality was given by Line 88, the worst by Line 91. The hybrids were mainly intermediate: one Puławy hybrid, Racter x Tyk-Kułak, was distinguished by a better quality of the undried leaf and greater suitability for fire curing.
In the variety Węgerski-Ogrodowy [Hungarian Garden] the selected lines were distinctly superior to the unselected populations; Line 28 gave specially good results compared with Line 34 which is now cultivated—its yield was higher and the leaf more elastic. The hybrid Racter x Dubec gave fairly good results but yielded less than Węgerski-Ogrodowy. Its leaf was more of the type of the medium leaf cigarette tobaccos.
The variety Jenidże was inferior to Trapezund [Trebizond] in yield and leaf quality though better than other varieties in rapidity of growth and drought resistance; it is early in maturity and dries easily.
In the variety Hercegowina the form Hercegowina włoska (Italian) was better than the Puławy form, though its yield was somewhat lower. In Virginians, Joyner was definitely better than Conqueror. The variety American was good in form and colour of leaf and in rapidity of growth but inferior in other characters. Bulgarian varieties proved superior in aroma but in leaf type inferior to local varieties.

1550. Cieślicki, Z. 633.71:575(43.8)
Sprawozdania z doświadczeń polowych wykonanych z tytoniami papierosowymi w małopolskich okręgach uprawy tytoniu w latach 1934, 1935 i 1936. **(Report on field experiments conducted on cigarette tobaccos in south-eastern Polish tobacco cultivation districts during the years 1934, 1935 and 1936).**
Prace z dziedziny uprawy i fermentacji tytoniu Zeszyt 7 (Seria A.—Prace naukowe) [Publications dealing with the cultivation and fermentation of tobacco plants. No. 7 (Series A.—Scientific papers)]. (Supplement to "Przegl. Uprawy Tytoniu") 1938 : Pp. 267.
Among the selected lines of Tyk-Kułak, No. 88 was distinguished on account of its large oval leaves which are slightly folded like Trapezund. It flowered later but matured only slightly behind the other lines. It was best in leaf quality, the leaves being elastic, producing a certain amount of bright leaves. It is more suitable for fire curing and gave 29 per cent more yield and was 35 per cent higher in commercial value (price of raw tobacco).
Different lines of Węgerski-Ogrodowy had different qualities. Line 21 was early, low in habit, with lax distribution of the leaves especially towards the tip; it also proved susceptible to bacterial infection. Lines 28 and 34 are somewhat later in flowering and maturity but have a better distribution of the leaves on the plant, the number of leaves at the tip being distinctly greater. Line 37 has a high nicotine content. The best yield and leaf quality have been exhibited by Line 34 which has also given the highest percentage dry matter, in which respect it has exceeded the unselected population by as much as 64 per cent, and was less affected by bacterial attack.

1551. Kaznowski, L. 633.71:575(43.8)
Podstawowe zagadnienia w dziedzinie hodowli odmian tytoniu. (**Fundamental problems in the realm of breeding tobacco varieties**). Prace z dziedziny uprawy i fermentacji tytoniu Zeszyt 8. (Publications dealing with the cultivation and fermentation of tobacco plants.—No. 8). (Supplement to "Przegl. Uprawy Tytoniu") **1937** : **55–59**.

The tobacco varieties cultivated in Poland in the past have been exceedingly varied, each small zone having its own special forms. The problem for the breeder is therefore to select from these manifold forms those best adapted to local conditions, in particular forms of the Kentucky and Virginia type with rapid growth in the early stages, strains resistant to disease, of improved flavour and aroma, with higher and lower nicotine content and with a desirable habit of growth. In the latter respect certain hybrids of Dubec x Raeter are instanced as being especially promising. Ease of curing and the capacity to produce a cured leaf with good properties are also important. A start has been made in breeding along these lines.

1552. Rogoziński, A. 633.71:575(43.8)
Nowa odmiana typu Kentucky. (**A new variety of the Kentucky type**). Przegl. Uprawy Tytoniu 1939 : **6** : 40–42.

Raczyński, F.
Kilka obserwacji nad nowymi odmianami : krzyżówką Kentucky x Szamoszaty oraz machorką Komarno. (**Some observations on the new varieties Kentucky x Szamoszaty hybrid and Komarno**). Ibid. 1939 : **6** : 44–45.

The variety Kentucky 3002 was crossed in 1930 with the cigar tobacco Szamoszaty, characterized by rapid growth. By selection among the segregates a new variety (Kentucky x Szamoszaty 5a/3) has been obtained, distinguished by quicker growth, greater hardiness and darker leaves; in spite of its more rapid growth however it flowers up to one week later than Kentucky 3002. It is taller, has a larger number of leaves, which are more elongated, glossy, resilient and resinous and are of better quality; they require a longer period of preliminary fermenting and drying. The new variety is higher than Kentucky 3002 in yield and is also resistant to virus and bacterial diseases.

It is reported in the second paper that the new hybrid 5a/3 when grown on a field scale gave a distinctly higher percentage of first and second classes, a yield increase of 77 per cent and an average price 24 per cent above that for Kentucky 3002.

The new Hungarian variety of *Nicotiana rustica*, Komarno, has given yields exceeding Pomorska by 31 per cent.

1553. Rogoziński, A. and
Rożnowska, L. 633.71:575(43.8)
Bieżące prace doświadczalno-hodowlane nad tytoniem w Puławach. (**Current breeding research work with tobacco at Pulawy**). Przegl. Uprawy Tytoniu 1938 : **5** : 141–46.

An outline is given of the work on tobacco breeding in progress at the Puławy institute. A large collection of varieties and selections from crosses is under constant observation and supplies of pure seed are obtained from them. The testing is carried out on three different types of soil. Examples are given of some of the successful crosses. Thus in 1933 a Virginia variety was crossed with American, (medium leaf cigarette tobacco) with the object of combining the aroma and earliness of the latter variety with the high yield, suitability for fire curing, production of so-called light leaf colours, adaptation to local conditions and resistance to disease characteristic of the Virginia variety. From this cross five excellent varieties have been produced, one of the Virginia type, one of the American type and three intermediate; they are being tested on different types of soil.

From crosses of the cigarette tobacco Raeter with Tyk-Kułak, Hercegowina and Dubec, of Samsun with American, Trapezund with Tyk-Kułak, etc., other promising hybrids have been obtained; also in the group of heavy tobaccos from Makhorka Pomorska (*Nicotiana rustica*)

with Czerbel and Selvaggio and from Kentucky x Szamoszaty; from this latter cross both a Kentucky and a cigar type have emerged.
Attention has been given to disease resistance—the new Puławy selection of Kentucky is more resistant to certain diseases than the parent Kentucky 3002; and also to aroma, nicotine content, flavour and a number of other characters.

1554. Zambrzycki, W. 633.71:575(43.8)
Przegląd doświadczeń rejonowych z tytoniem, prowadzonych w Okręgu Krakowskim w latach 1934–1937. (**Survey of the regional experiments with tobacco carried out in the Krakow district in the years 1934–1937**).
Przegl. Uprawy Tytoniu 1938 : **5** : 16–18.
The superiority of the selected line No. 3002 of Kentucky produced at Puławy has been confirmed; and in Virginia tobacco the variety Joyner, which has proved superior in leaf structure and in percentage of the light classes. Other varieties have been tested, including the Puławy hybrid Kentucky x Szamoszaty line 5a/3, which is fairly uniform in habit, resistant to disease, has resinous and elastic leaves, which in form are of the Kentucky type but more elongated and larger than those of Kentucky 3002; the variety gives high yields and a high percentage of first class product. The rather flaccid leaves and late maturity are features it is hoped to remove by further breeding. It also requires a somewhat prolonged period of drying.

1555. Bolsunov, I. I. 633.71:575:581.145
(**A valuable hybrid of *Nicotiana rustica* devoid of inflorescence and upper suckers**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 2–3 : 40–41.
Having studied the variations and anomalies exhibited by hybrids of various geographical races of *N. rustica* from the Ukraine, Siberia, Manchuria, Central Asia, Armenia, Afghanistan, Iran, Abyssinia and North and South America, etc., a cross was made between the Abyssinian form Koljubi and the Stemask type. In the F_2, plants showing partial atrophy or complete absence of the axillary buds and plants entirely devoid of inflorescences were observed.
Selection in the F_2-F_3 for reduced capacity for the formation of suckers combined with absence of inflorescence on the upper portion of the plant was successful and constant forms (including the new hybrid Omega) are to be used to obtain élite plant material.
Some difficulty was experienced in fixing the character for absence of inflorescence, probably owing to the action of modifying factors since the number of main factors conditioning this anomaly is believed to be relatively small.
In the new varieties seed is obtained solely from secondary suckers on the lower portion of the plant.
The use of such plants in cultivation would greatly reduce the labour involved in topping and pruning.

1556. Christoff, M. and Gentscheff, G. 633.71:575.11.061.6:581.45
[**Genetic study on *N. Tabacum* L. (II. Colour of the leaves)**].
Annu. Univ. Sofia, V. Fac. Agron. Sylvicult. Livre 1.-Agron. 1934–35 : **13** : 384–92.
In crosses between the varieties *alba* and *Babura* with yellow-green leaves and the varieties *macrophylla* and *sanguinea* with deep green leaves, the F_1 plants were intermediate in colour. In F_2 there was a 15 : 1 ratio of plants with deep green and intermediate leaves to those with yellow-green leaves like those of the *alba* and *Babura* parents.

1557. 633.71:575.11.061.6:581.46
GENTSCHEFF, G. 633.71:575.11.061.1:581.46
[Genetic study on *Nicotiana Tabacum* L. (I. Corolla colour and shape)].
Annu. Univ. Sofia, V. Fac. Agron. Sylvicult. Livre 1.-Agron. 1934–35 : **13** : 91–122.

In the F_2 of crosses between red and white flowering varieties of *N. Tabacum* a 9 : 3 : 4 ratio of red, pink and white-flowered plants was obtained. The red-flowered types used may be represented as *WWRRPP* and the white-flowered type as *wwRRpp*, where *W* is the factor for red flowers, *R* is a factor which dilutes red to pink and *P* is a factor which inhibits the action of *R*. Crosses of red x pink gave a 3 : 1 ratio of red to pink, the pink type being *WWRRpp*. Pink x white crosses gave in F_2 a 3 : 1 ratio for pink v. white, as would be expected from the above formulae.
Crosses involving the varieties *macrophylla* and *angustifolia* showed that their difference in corolla shape is determined by two genes, neither of which is completely dominant. The *macrophylla* type is represented as *MMll* and the *angustifolia* type as *mmLL*.

1558. 633.71:575.11–181.13
HONING, J. A. 633.71:575.11
***Nicotiana Tabacum* crosses. The Kloempany dwarf factor. Polymery as to single and double flowers. Interaction of factors. A necrotic dwarf. A dwarf without ovules.**
Genetica 1939 : **21** : 109–52.

An incompletely dominant factor *A* for the dwarf condition gave a deficiency of normal plants in *aa* ♀ x *Aa* ♂ back-crosses but normal ratios in the reciprocal back-cross. The above deficiency became more accentuated when the seeds had aged, the proportion of normal plants decreasing from 19·6 to 2·5 per cent in 9 years. It was found that the deficiency was not due to certation in favour of pollen carrying *A*.
Very large deviations were found in some dwarf x *N. Tabacum* var. *atropurpurea* crosses and excess of the tall type occurred in one cross. Segregation for other factors was normal. No simple genetic scheme appeared to explain the above facts.
The factor pair *Aa* segregates independently of the *deformis* factor pair *Def def*. Homozygous *deformis* plants, which never flower in the tropics, may be induced to do so when the factor *A* is also present.
The double-flowering character in Vorstenlanden tobacco is a simple recessive to single flowering in Vorstenlanden, but a double recessive to single-flowering Deli tobacco, the three types being symbolized as $d_1d_1d_2d_2$, $D_1D_1d_2d_2$ and $D_1D_1D_2D_2$ respectively. Both D_1 and D_2 segregate freely from *def*, *A*, and the factor pair *Ss* for petiolate and sessile leaves. As a rule there is a shortage of double-flowering plants in crosses. This deficiency is greater in some phenotypes than in others.
The necrotic dwarf type studied was a simple recessive to normal, the gene pair being denoted as *Ne ne*. There is no linkage with the factor *A*. A less necrotic type was also found.
From the cross *N. Tabacum* var. *atropurpurea* x Vorstenlanden 120, 40 dwarfs with pale and very narrow leaves segregated out of a family of 678 F_2 plants. They were entirely sterile.

1559. 633.71:575.243
VERBENKO, G. V. (Editor) 633.71:575.127.2:576.356.5
(Brief summary of the results of the work of Molotov's Nikita Botanic Garden 1812–1938). Vsesojuznaja Akademija Sel'skokhozjaistvennykh Nauk im. V.I. Lenina. Gosudarstvennyi Nikitskii Botaničeskii Sad im. Molotova. (Lenin Academy of Agricultural Sciences, Molotov's Nikita Botanic Garden) Jalta 1938 : Pp. 86.

Mutations were obtained artificially in the tobacco variety DN44 by the use of X-rays, ether vapour and low temperature; they were all in the nature of translocations and displayed varying degrees of abnormality of growth and sterility and from a practical point of view are of little or no interest.

From the lower callus of leaf and stem cuttings tetraploids have been obtained in geranium and *Nicotiana glauca* and amphidiploids of *N. rustica* x *N. Tabacum* and of *N. glutinosa* x *N. rustica*. The chromosome duplication overcame the sterility and in all cases resulted also in an increase of disease resistance, nicotine content and oxidizing capacity.
Various polyploid hybrids of *N. Tabacum* with *N. glutinosa* and *N. silvestris*, made for the purpose of introducing the resistance of the two latter species to *Erysiphe cichoracearum*, were very low in burning quality and they are being subjected to further selection and crossing. Sesquidiploids of *N. digluta* x *N. Tabacum* segregated for all characters and in F_3 a constant immune 48 chromosome form of good quality, of the American type, has been selected. The hybrid (*N. Tabacum* x *N. silvestris*) x *N. Tabacum* by open pollination produces a highly segregating progeny and in the F_3 a homozygous immune 48 chromosome form of the American type has again been produced.

1560. 633.71:576.16:576.356.5
KOSTOFF, D. 633.71:575.127.2
Cytogenetic determination of a new Australian tobacco species and its mode of origin.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **22** : 267–69.
This paper is similar in substance to that summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 940.

1561. WOYNO, H. 633.71:576.16:581.4
Morfologia zewnętrzna różnych odmian *Nicotiana rustica* z uwzględnieniem anatomii machorki pomorskiej. (**Morphology of various forms of *N. rustica*, with particular reference to the variety Pomorska**).
Prace z dziedziny uprawy i fermentacji tytoniu Zeszyt 4 (Seria A.—Prace naukowe). [Publications dealing with the cultivation and fermentation of tobacco plants. No. 4 (Series A.—Scientific papers]. (Supplement to "Przegl. Uprawy Tytoniu") 1937 : Pp. 88.
The history of the discovery of tobacco and its introduction into Europe is briefly outlined, Anastasia's views on the origin of *Nicotiana Tabacum* from *N. rustica* x *N. petunioides* being quoted. The systematics of the Solanaceae and the genus *Nicotiana* in particular are outlined, special attention being given to *N. rustica* and its varieties.
Detailed descriptions are given of the morphological characteristics of *N. rustica*, based mainly on observations of the variety Pomorska but supplemented by a study of a number of other varieties, both green and yellow leaved types. The conclusion is reached that Pomorska is not a pure variety but comprises at least two types and requires further selection. Certain of the other varieties are also indicated as being impure.

1562. BARTOLUCCI, A. 633.71:581.143.26.035.1:575
Il fenomeno della fotoperiodicità ed il tabacco. La *N. tomentosa* Ruiz et Pavon pianta a giorno breve. (**The phenomena of photoperiodism and tobacco. *N. tomentosa* Ruiz et Pavon a short-day plant.**)
Boll. Tec. Tab. 1939 : **36** : 5–12.
By growing plants of *N. tomentosa* under short-day conditions flowers can be obtained within a year from sowing and crosses are more easily made with other species.

1563. GAGE, C. E. 633.71-2-1.521.6:575(72.95)
The tobacco industry in Puerto Rico.
Circ. U.S. Dep. Agric. 1939 : No. 519 : Pp. 54.
Inter alia, a brief statement is made of the research programme of the Tobacco Institute in Puerto Rico. It is hoped to breed strains of cigar filler and cigar shade tobacco resistant to mosaic disease and to the black shank or fungus wilt disease caused by *Phytophthora parasitica* var. *nicotiana*. In addition, attention is being paid to the development of improved types of cigar filler tobaccos and of disease resistant, flue cured types.

1564. 633.71-2.8-1.521.6:575.127.2
KOSTOFF, D. 633.71:581.192.6:575.127.2
Indicii citogenetice pentru aplicarea hibridizării interspecifice în scopul creiării de forme dorite de tutun. (**Cytogenetic indices for applying interspecific hybridization in breeding desirable tobacco forms**).
Bul. Cultiv. Ferment. Tutun. 1939 : **28** : 165–76.

Of the Australian species of *Nicotiana* none is likely to be of importance in crossing, except *N. suaveolens* as an ornamental. This species is highly resistant to virus diseases and *N. Eastii* to *Peronospora*, but it would be extremely difficult to transfer these characters to *N. Tabacum*.

N. tomentosiformis and the nearly related *N. tomentosa* are the most vigorous tobacco species and may be used in crossing to increase leaf and plant size in *N. Tabacum*, either directly or in the form of triple crosses with *N. silvestris* of the *N. triplex* type. *N. triplex* may be used for the production of tobacco varieties with extremely low nicotine content, as well as for the improvement of the leaves in cigar tobacco.

The good leaf qualities of *N. alata* and *N. Sanderae* cannot, apparently, be directly transferred to *N. Tabacum*. A possible approach is to use autotetraploid forms of these species in crossing.

Various species of *Nicotiana* are able to localize infection with virus diseases, particularly mosaic, by forming necrotic spots at the place of infection. *N. glutinosa* and *N. rustica* are the most promising of these for use in crosses with *N. Tabacum*, though back-crosses of *N. glutinosa* x *N. Tabacum* to *N. Tabacum* have not yet been obtained. *N. rustica* apparently derived its necrotic reaction from its parent species *N. undulata*, but crosses of the latter species with *N. Tabacum* have not been successful. Some selfed plants from (*N. rustica* x *N. Tabacum*) x *N. Tabacum* back-crosses have shown true immunity to mosaic virus without the formation of necrotic spots.

Attempts have been made to transfer the *Oidium* resistance of *N. glutinosa* to *N. Tabacum*.

Improvement of *N. rustica* for smoking purposes may best be effected by crossing with *N. Tabacum*. For increasing the citric acid content of *N. rustica*, *N. Langsdorffii* and *N. glauca* deserve attention. Crosses with *N. Langsdorffii* are effected with great difficulty but some forms of *N. rustica* give hybrids with *N. glauca* which yield seeds when back-crossed to *N. rustica*. *N. rustica* x *N. glauca* hybrids and their allopolyploids are also very promising as sources of anabasine.

1565. WELLENSIEK, S. J. 633.72:575(92)
Biologisch en landbouwkundig werk in Nederlandsch Indië. Theeselectie. (**Biological and agricultural work in the Dutch East Indies. Tea selection**).
Vakbl. Biol. 1939 : **20** : 201–10.

A concise account of experiment station work in the Dutch East Indies on tea selection and breeding, in which mention is made of the economic trend and background, the wide field of research, staff and administration and the valuable contact between experiment station workers and planters. The method of experimentation and the author's own contributions from 1931–38 to research on breeding for yield are outlined with concluding observations on some findings of wider application, such as the effect of environment on high and low producers and the relation between the size and the specific gravity of seed.

Most of the relevant literature cited has been already reviewed in "Plant Breeding Abstracts".

1566. MUTOVKINA, T. D. 633.72:575.42
(**Elimination and selection of tea seedlings**).
Soviet Subtropics 1939 : No. 5 (57) : 45–49.

Many of the tea plants at present growing are natural hybrids between Chinese and Indian plants. Their characteristics are described. They are more vigorous in stem formation but variable in type. For further planting, careful selection of the mother plants is necessary; first of all plants of low quality are discarded and plants with low vigour, too compact erect habit, low regeneration capacity, short vegetation period and early wood formation in the young shoots, short internodes and too dense disposition of the leaves on the shoots are

eliminated; also small leaves less than 6 cm. long or 2 cm. wide, rough leaves or leaves folded into a cylinder, closely appressed to the stem or too erect.
Characters for which selection is practised are quality, yield (shoot formation, vigour of growth, size of leaves and their distribution on the shoot, length of vegetative period, degree of woodiness, length of internodes), disease resistance and resistance to drought and frost. Forms with a semi-spreading habit usually produce the greatest number of growing points.
The characters mentioned above can best be judged in two-year old bushes, when the main selection should be effected. This is preceded by a preliminary discarding and further selection can be carried out later.

1567. Werkman, J. W. 633.72:581.165.1:581.6:578.08
Het keuren van theecloonen. (**The judging of tea clones**).
Bergcultures 1939 : **13** : 520–24.
The practice followed by the lecturer in judging tea clones is described in detail with a list of the points specially considered in comparing the leaves of clones with those of the mother trees. The flavour is estimated by taking a pekoe leaf in the mouth and judging the strength by the taste. The importance of quality determinations in the future of tea breeding and clone selection is mentioned.

1568. Simura, T. 633.72–2.421.9–1.521.6:575.11
(**Studies on the resistance to brown blight in tea plants**).
Jap. J. Genet. 1939 : **14** : 243–47.
Varietal differences to brown blight (*Guignardia camelliae*) are known to exist in tea. Tests of a number of varieties representing forms with high, low or medium resistance indicate that the chemical composition of the leaf tissue is an important factor in resistance though the exact basis of this resistance is not yet understood. It can however be said that the lower the *p*H of the leaf sap, the lower is the resistance and that the tannin content of the leaf shows a similar positive correlation with resistance.
Pubescence on the back of the leaf appears to be negatively correlated with resistance to mycelial attack.
Varietal differences determining the time of picking also have their importance as means of avoiding infection when blight is prevalent.
Selfings of 8 strains of tea segregated in such a way as to suggest that more than two dominant genes are involved in the production of resistant types.

1569. Pacheco Herrarte, M. 633.73:575(72.81)
El mejoramiento del cafeto. (**Improvement of coffee**).
Rev. Agric., Guatemala 1939 : **16** : 83–84.
Planters are warned against giving up Arabica in favour of any of the new species or their hybrids.

1570. Ligt, N. M. de 633.73:575.12
Conuga-koffie. (**Conuga coffee**).
Bergcultures 1939 : **13** : 726–32.
A recommendation to planters to use suitable clones of Conuga is supported by data on yield in which Conuga has, on occasion, surpassed Robusta. Conuga is self-pollinating and also flowers throughout the year, thus reducing the risk of losses. Its resistance to various diseases and pests is mentioned.
The writer believes a correlation exists between the development of root hairs and productivity.

1571. Franco, C. M. 633.73:576.356.5:581.49
Relation between chromosome number and stomata in *Coffea*.
Bot. Gaz. 1939 : **100** : 817–27.
The number of stomata per unit area of leaf surface decreases and the area of an individual stoma increases with a doubling of the chromosome number.

1572. Roelofsen, P. A. 633.73:581.6:575(92)
Beïnvloeding en behoud van de kwaliteit van robusta-marktkoffie. (**Influencing and conserving the quality of Robusta market coffee**).
Bergcultures 1939 : **13** : 812–17.

Having discussed how the quality of Robusta for market may be best retained, the author refutes an assertion that the experiment stations were not attempting to breed for quality, i.e. flavour (not bean size). The stations have in fact arranged a series of tests for the separate preparation of coffee from about 30 Robusta clones at Soember Asin and each clone has been found to have its individual flavour and type of coffee, regardless of whether grown on different or the same plantations and stocks. The results have already shown that blends of coffee from different clones may give a more agreeable product than the individual clones separately, and this even though the individual component clones may be inferior as regards flavour.

Fortunately Robusta plantations comprise many clones for cross-pollination purposes. It is not possible categorically to eliminate in selection all clones of bad flavour, since it is possible that in a mixture they may contribute whatever quality is necessary to produce a full and pleasing aroma.

1573. Chevalier, A. 633.73:582
Sur quelques caféiers et faux caféiers de l'Angola et du Mayombe portugais. (**On some forms of coffee and false coffees of Angola and Portuguese Mayombe**).
Rev. Bot. Appl. 1939 : **19** : 396–407.

Descriptions are given of the following new varieties and species: *C. liberica* Bull. var. *Gossweileri*, var. nov.; *C. canephora* Pierre var. *Gossweileri*, var. nov.; *C. Carrissoi* Chev., sp. nov.; *C. mayombensis* sp. nov.; and also three new species of the section Eucoffea, *C. togoensis*, *C. mayombensis* and *C. oyemensis* and of the new genus, *Psilanthopsis* including *P. Kapakalia* (Hort. Bogor.) Chev., Comb. nov. = *Coffea Kapakata* Hort. Bog. Ms.

1574. Chevalier, A. 633.73:582(69.1)
A propos des *Lemyrea* de Madagascar. (**Concerning the *Lemyrea* of Madagascar**).
Rev. Bot. Appl. 1939 : **19** : p. 250.

The section of *Coffea* named *Lemyrea* in a recent paper of the author on the wild coffees of Madagascar (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1154) has been given, on anatomical grounds, the rank of a genus, *Lemyrea* Chev. et Beille, and includes the species *L. utilis* (Chev.) Chev. et Beille, *L. ciliolata* (Chev.) Chev. et Beille and *L. Krugii* Chev.

1575. Snoep, W. 633.73–1.557:581.165.1(92.2)
Productiegegevens van robusta-cloonen in het ressort van het Proefstation Midden-en Oost-Java. (**Yield data of Robusta clones in the district of the Central and East Java Experiment Station**).
Bergcultures 1939 : **13** : 652–61.

A progress report on the performances of Robusta clones at various places in the district served by the Central and East Java Experiment Station. Observations were also collected on bean size, coffee berry borer infestation, flowering and the relative value of clones as a source of material for grafting.

Judged on their general performance on the various experimental estates the clones SA 13, SA 34, SA 56, BP 39 and BP 42 were among the best. SA 85, SA 109 and Moemb. III–04 also did well. SA 13 and BP 42 are apparently the highest yielding. The older Bangelan clones were poor but some of the newer ones probably include some good producers, such as Bgn 300.

BP 42 had by far the largest beans and SA 74 and SA 158 were also superior in this respect to the other clones tested. SA 13 and SA 34 proved least susceptible to coffee berry borer. SA 56 flowered earliest and SA 34 latest.

1576. Psareva, M. M. 633.75:575(47)
(Results of research on poppy breeding).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 1 : 16–19.

Selection was begun at the Voronezh Regional Experiment Station with local forms of poppies as well as plants obtained from other regions and from the world collection of the Institute of Plant Industry. The aims were: a blue seed coat, high yield and oil content, uniform ripening, absence of shedding, resistance to pests, etc. A successful selection for seed colour is the blue poppy strain No. 1042.

The biology of the poppy was studied with special reference to self-pollination and yield of seed. Selfing reduced the yield.

Open pollination and the use of spatially separated cages were adopted and individual and mass selection methods are being employed in breeding for productivity which is determined by the number of rays of the stigma, by the pod shape and the amount of branching. Other workers' views on this point are cited. The author's own findings indicated a direct correlation between seed yield and the number of stigmatic rays, but no correlation with the shape of the capsule. A negative correlation was found in forms with relatively little branching between degree of branching or number of capsules per plant, and size of capsules and yield of seed from them. In fact little difference was noted in the productivity of forms with and forms without marked branching.

Selection for uniformity in the time of ripening was successfully carried out. Non-dehiscent forms are also being bred.

The author found no correlation between seed colour and oil content.

In yield of seed and of oil (per hectare) the strain No. 1042 which was produced at the Voronezh Station, has proved outstanding in 3-year variety trials.

1577. Yamazaki, Y. 633.75:576.356.5:576.356:581.036.5
(Effects of low temperature treatments on the reduction division in opium poppy, *Papaver somniferum*).
Proc. Crop Sci. Soc. Japan 1936 : **8** : 385–92.

Material of *P. somniferum* (*n* = 11) was subjected to low temperature treatment immediately before meiosis or during the early stages of the first meiotic division. This treatment resulted in the production of univalents, which were observed at diakinesis and at metaphase I. Owing to lagging and irregular distribution of these univalents, nuclei with from 6 to 16 chromosomes were found. In some cases dyads were formed as a result of wall formation at interkinesis.

The author also observed chromosome doubling at various stages, the main mechanisms being the formation of a restitution nucleus at the first division and the union of chromosome groups at anaphase II.

As a result of these abnormalities, dyads, triads, tetrads and pentads were formed. The resulting pollen grains contained various abnormal chromosome numbers, notably the diploid number. The production of polyploid poppy plants by low temperature treatment is therefore considered possible. The most effective treatment was exposure to a temperature of 3–4° C for 156 hours at the leptotene and zygotene stages.

1578. Holubinsky, I. N. and
Schloss, M. S. 633.79:581.163:581.162.3
A contribution to the problem of parthenogenesis in *Humulus Lupulus* L.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 486–87.

Large numbers of inflorescences of different varieties of *H. Lupulus* L. have been isolated by various methods and examined for parthenogenetic seed production during 1937 and 1938. Of some 869 inflorescences isolated, only 3 formed fruits, delay in isolation and subsequent pollination probably accounting for these exceptions.

This failure to produce seed has been confirmed by the cyto-embryological study of about 600 ovules, in which no trace of parthenogenetic or apogamous development could be found. Seed setting is explained, therefore, by pollination by male plants, parthenogenetic seed setting occurring to an insignificant extent if at all. J. Wilson.

AROMATIC PLANTS 633.8

1579. Wulff, E. V. and
Nilov, V. I. (Editors) 633.81
(Essential oil plants, their cultivation and essential oils).
Inst. Pl. Ind., Lenin Acad. Agric. Sci., Leningrad 1937 : **3** : Pp. 407.

A collection of papers containing useful information on the botanical features, cultivation, area of distribution, disease and pests and economic uses and value of species belonging to the following families: Geraniaceae, Umbelliferae, Oleaceae, Labiatae and Compositae. The content, properties and method of extraction of the various oils are also dealt with and a special bibliography on each species is included.

1580. 633.84:575(43.91)
Obermayer, E. 633.84:581.19
Der ungarische Gewürzpaprika, sein Anbau und seine Züchtung. **(Hungarian paprika, its cultivation and breeding).**
C.R. Ve Congr. Int. Tech. Chim. Industr. Agric. Schéveningue 1937 : **2** : 426–35.

The origin, characters and mode of cultivation, pests and diseases of Hungarian paprika are described. Research stations for the study of this crop have been established at Szeged and Kalocsa. Since Hungarian paprika is out-pollinated to a large extent, widespread crossing within the type and also with other varieties, particularly Bulgarian paprika, has occurred and many different land varieties have arisen. By individual plant selection within these mixed populations two new types of spice paprika, one with a tri- and one with a bicarpellary ovary, have been developed, both early ripening and high yielding, with symmetrical fruit shape, smooth skin and firm, thick flesh. These varieties are replacing the old land forms in the Kalocsa region and elsewhere. In addition, attention is being paid to the development of forms with minimum pungency for export purposes. Selection is being carried out in the progeny of a natural intervarietal hybrid discovered at the Kalocsa station, and numerous capsaicin-free types are being developed.

1581. Odland, M. L. and
Porter, A. M. 633.842:581.47:575.11.061.6
Inheritance of the immature fruit color of peppers.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 647–51.

In a study of the inheritance of the different shades of green immature fruit colours in peppers (*Capsicum*) yellowish green varieties (Hungarian Yellow Wax and Tobasco) were crossed with a very pale green or sulphury white variety (Ornamental) and with cedar green varieties (Oshkosh and Red Cherry). The last named were also crossed with Ornamental. F_2 and back-cross ratios showed that yellowish green was a simple dominant to sulphury white and a simple recessive to cedar green.

In the crosses between cedar green and sulphury white varieties 15 : 1 F_2 ratios and 3 : 1 back-cross ratios of green to non-green were obtained.

These results support the conclusion reached from unpublished work that there is a series of non-allelomorphic factors which are all present in the recessive condition in sulphury white varieties thus: $g_1\ g_1\ g_2\ g_2 \ldots . g_n\ g_n$. Changing any one of these to the dominant condition produces yellowish green and any two to the dominant condition produces cedar green. Dominance is apparently often incomplete. J. L. F.

OIL PLANTS 633.85

1582. Kursell, C. von 633.854.797:575(43)
Zuchtarbeiten an der neuen Ölpflanze Saflor. (**Breeding work with the new oil plant safflower**).
Pflanzenbau 1939 : **15** : 463–82.

The floral biology is described; most plants were self-sterile, though some plants with a quite high degree of self-fertility were also observed. The value of a number of varieties of different origin was compared and those most promising for breeding purposes are indicated. Great variation was observed in morphological characters and a positive correlation was established between seed yield and diameter of the inflorescence, spined forms having generally higher values for these characters than spineless. Yield per plant varied from under 10 grm. to 89 grm. and considerable improvement in yield is possible therefore by mere selection. A study of the progeny of the élite plants showed segregation to be occurring for many morphological characters but in yield and hectolitre weight most progenies were equal or superior to the mother plants. The best in respect of yield and oil content are being selected.

RUBBER PLANTS 633.91

1583. Dijkman, M. J. 633.912:575.42(92.2)
Verdere resultaten der Heveaselectie in West-Java. (**Further results of *Hevea* selection in West Java**).
Bergcultures 1939 : **13** : 492–503.

In this lecture the relative merits of seedlings and buddings as planting material were discussed with observations on the use of so-called clonal seed (i.e. untested seed from good clones by open pollination) and data are cited to show that controlled crosses gave higher yields than open pollinated seedlings.

The recommendations of numerous clones and seedlings for 1938–39 are considered including the more recently developed clones Limburg I and Pataroeman 190 which are regarded as promising. Among the clones not yet tested but regarded as likely to give good yields are some derived from the crosses of Tjir I with Tjir II, Tjir II with Tjir I and Tjir I with Tjir III.

The relation between various morphological and physiological features are being studied in seedlings and buddings at the Tjiomas experimental plantation. The difference between the bast thickness in buddings at 1·50 m. and the average below 1·50 m. in seedlings of the same age was very slight.

A correlation was found between growth in thickness and thickness of the bast in buddings.

Differences in resistance to wind damage between the various clones are thought to be correlated more with differences in the type of branching and the structure of the wood than with growth vigour.

Further evidence was found showing that high producing clones are not necessarily susceptible to brown bast and that there is little correlation between yield and this defect. The possible existence of correlations between yield and susceptibility to other diseases was also examined.

Two new groups of seedlings the Tjikadoe seedlings and the open pollinated seedlings of AV 163 have recently given promising yields in trials. The performance of the AV hybrids, of PR 7 selfed and of the seedlings from the cross Tjir I x Tjir XVI and its reciprocal is recorded, with observations on resistance to wind damage, brown bast susceptibility and other characteristics. The clones Tjir I and PR 103 which are susceptible to damage by both wind and brown bast apparently transmit these defects to their progeny.

The tapping of young trees as a way of determining yield is also discussed.

1584. Vollema, J. S. and
Dijkman, M. J. 633.912:581.165.1:575.42(92.2)
Resultaten der toetsing van Heveacloonen in den proeftuin Tjiomas-II. (**Results of the testing of *Hevea* clones in experimental garden Tjiomas-II**).
Arch. Rubbercult. Ned.-Ind. 1939 : **23** : 47–129.

A slightly more recent and highly detailed account of the results summarized elsewhere (Cf. Abst. 1583). Numerous statistical tables are appended.

1585. Kaznowski, L. and Rumiński, B. 633.913:575(43.8)
Próby aklimatyzacji i badania chemiczne roślin kauczukodajnych w Państwowym Instytucie Naukowym Gospodarstwa Wiejskiego w Puławach.
(**Acclimatization of rubber plants in Poland**).
Przegl. Doświad. Roln. (Rev. Agric. Res.) 1938 : **1** : 12–20.

Of the various new rubber plants tested the only one of value for Poland has been found to be *Taraxacum kok-saghyz*. Results of chemical analyses are presented. The rubber contents show great seasonal variations but also vary from plant to plant, some plants containing as much as 9 per cent. Selection work has been started, only those plants containing 8–10 per cent rubber being retained.

1586. Vel'tiščev, P. A. 633.913:581.162.3
(**The pollinators of *Parthenium argentatum* in U.S.S.R.**).
Priroda (Nature) 1939 : No. 4 : 52–53.

The results of experiments designed to determine which insects are instrumental in pollinating guayule are reported.

CAMPHOR PLANTS 633.95

1587. Lapin, V. K. 633.956:575.129:576.356.5:581.04
Production of an amphidiploid basil *Ocimum canum* Sims. x *Ocimum gratissimum* L. by colchicine treatment.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 84–87.

By treatment of cuttings of F_1 *Ocimum canum* x *O. gratissimum* with 0·5 per cent colchicine, an amphidiploid has been produced and in contrast to the diploid, is fertile and sets good seed, indicating the possibility of obtaining eugenol-bearing hybrid basil from seed instead of cuttings. J. Wilson.

FRUIT TREES 634

1588. Shashkin, I. N. 634:575.127
(**Fruit-trees of the Far Eastern Region in I.V. Michurin's researches**).
Priroda (Nature) 1938 : Nos. 11–12 : 51–59.

By following the principles of Michurin it has now been possible to produce hardy forms of most fruits, some of them at the same time possessed of quite high quality. The forms growing in the far eastern zones of the U.S.S.R. have played a special role in this work, many of them, such as *Cerasus Maximoviczi* Rupr. and *C. sachalinensis*, being the only hardy forms known that will cross with the cultivated species.

1589. 634:608.3
Die amerikaniscshen Pflanzenpatente Nr. 95 bis 144.
(**The American plant patents Nos 95 to 144**).
Züchter 1939 : **11** : 192–200.

No. 100 is an avocado sport that ripens in summer, produced by Jennie C. Gano, Whittier, Calif.; the fruit is 13–17 cm. long, 8–10 cm. wide, up to ½ kg. in weight.
No. 101 is a strawberry seedling from the cross (Americus x Badarena) x Chesapeake; it ripens early, mid-May, the fruit is 3¾ to 4½ cm. in diameter, deep red up to the centre, firm and good for transport; produced by P. Wray, White Salmon, Wash.
No. 111 is a plum, produced by Jennie B. Thompson, Pasadena, Calif. from a nameless seedling; it is large and thick skinned, good for keeping and for transport.
No. 112 is an ever-bearing strawberry, produced by G. D. Aiken, Putney, Vt., from a cross between Howard 17 and Superb; it bears as many runners in the second as in the first years, especially if fruiting is hindered during the middle of the summer. It excels all other autumn varieties in flavour.
No. 113, a yellow raspberry found wild by A. B. Curtis, Sarona, Wis., bears large numbers of yellow fruits with a pink bloom, ripening earlier than the average. The plant is vigorous and extremely hardy; it is almost free from thorns.

No. 119 is a mango arising from the cross of either Mulgoba or Haden with Cecil, made by E. G. Wilkenson, Naples, Fla. It bears large fruits weighing 400–800 grm., with thin skins, excellent flavour and flesh free from fibre; it keeps well and is good for transport.
No. 120, a peach produced by D. S. Byers, Clyde, Ohio, is a sport from Elberta, very regular in bearing and very resistant to frost and drought.
No. 124 is an orange mutant found by Pearl C. Mohn, Anaheim, Calif., on a tree of Valencia; the fruit is seedless and of better flavour than Valencia and particularly good for transport and preserving.
No. 125 is an early sport of the York Imperial apple, found by E. W. Hartman, Cashtown, Pa.
No. 128, a Washington navel orange sport characterized by better bearing and earlier ripening, thus escaping the effects of June drop, was found by R. Robertson, Redlands, Calif.
No. 139 is an avocado of the Guatemala type found by R. G. Hass, La Habra, Calif.; the fruit weighs 170–283 grm., has a thin but leathery skin and is therefore good for transport, has creamy flesh free from fibres and of an excellent nutty flavour, with an oil content of 18·30 per cent.
No. 142 is a citrus combining the properties of the orange and the citron, produced by J. M. Ater, Chula Vista, Calif. It resembles the citron in form but the flesh is yellow to orange in colour and very juicy, tart in flavour and suitable for preparing beverages. The plant is very disease resistant.

1590. Petrov, M. P. 634–1.524(47)
(On wild fruit-trees of Turkmenian highlands).
Priroda (Nature) 1939 : No. 5 : 55–68.
The mountain gorges of Kopet-Dag are rich in all sorts of fruit trees and nuts, which grow wild and are utilized for food by the local inhabitants. They include *Vitis vinifera silvestris*, *V. vinifera spontanea*, purely wild forms being found mixed with forms of a cultivated type (white grapes, etc.) that are obviously "escapes", in proportions differing in different valleys; *Juglans regia*, where the majority of the forms are of the wild type; *Ficus Carica* and *Punica granatum*, where no line of demarcation exists between wild and cultivated forms; *Prunus cerasifera* and many hybrids with other species, including *Amygdalus ulmifolia*; *Prunus microcarpa*, one of the most drought-resistant of known fruit trees; *Pistacia vera*, found in great variety; *Amygdalus communis*, of which both wild and cultivated types occur; *Cydonia oblonga* of which mostly wild forms occur. *Pyrus Boisseriana*, a species of recent penetration, and others.
Fossils of identical or closely allied species have been found in the neighbouring lands and the present populations are almost certainly relics of the tertiary flora, still however in the process of active evolution.

1591. Moore, R. C. 634.11:575(75.5)
Developing new varieties of apples at the Virginia Experiment Station.
Virginia Fruit 1939 : **27** : 14–15.
Some 3,000 seedlings derived from crosses between such varieties as Winesap, Lowry, Delicious, Jonathan and Rome are now being grown at the Station, and about 1,300 of the most vigorous have been top-grafted on larger trees to hasten fruiting. Annual records relating to plant type and disease resistance are being kept, and the possibility that some of the seedlings may prove valuable as disease-resistant root stocks is also being kept in mind.

1592. Pickett, B. S. 634.11:575:578.08
Science and the future of pomology.
Trans. Ill. Hort. Soc. (1936) 1937 : **70** : 177–88.
In discussing the future of apple breeding, the author points out that the process will be much less haphazard when the performance of the major varieties as parents in crosses is known.
Triploid apples are in general not likely to be useful as parents.
With respect to wide crosses, many seeds that would otherwise fail to develop may be induced to grow when the embryos are excised and cultured on nutrient agar.

1593. Alderman, D. C. and Lantz, H. L. 634.11:575.11:581.47 634.11:575(77.7)
Apple breeding : inheritance and statistical studies on the fruits of crossbred seedlings with Antonovka parentage.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 279–83.

The inheritance of fruit size, colour and quality and of time of maturity was studied in crosses involving Antonovka and the varieties Black Oxford, Delicious, Ashton, Jonathan, King David and Grimes. The inheritance of all the characters except fruit colour was complicated and multi-factorial. With regard to fruit colour, the progenies crossed with the red varieties Ashton, Black Oxford, Jonathan and King David were all or very nearly all red, indicating dominance of the red colour over the yellow colour of Antonovka and the practical homozygosity of the genes for red colour in those varieties. The red variety Delicious gave what appeared to be a 1 : 1 ratio of red v. yellow. The cross with Grimes gave only 4·1 per cent of plants with red or striped fruit.

A few of the seedlings grown appeared to be superior to Antonovka and nine were selected for further test.

1594. Dorsey, M. J. 634.11:575.14
Inbreeding experiments with the apple.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : p. 292. (Abst.).

Since 1909, 43,902 flowers have been selfed, giving 2,201 fruits and 5,468 seeds. Of these 1,603 germinated and 1,326 were planted out; 128 have fruited so far and 828 have died or were otherwise eliminated before reaching a height of five feet. Some of the inbred seedlings are vigorous and fruitful at a relatively early age. In some cases the third generation of inbreeding has been reached. J. L. F.

1595. 634.11:575.252:608.3(79.7) 634.256:575.242:634.25:608.3(74.9) 634.23:575:608.3(77.1)
Die amerikanischen Pflanzenpatente Nr. 89 bis 94. (**The American plant patents Nos 89-94**).
Züchter 1939 : **11** : 47–48.

No. 90. Apple. A bud sport of the Delicious variety patented by H. I. Shotwell, differing from the normal only in its more deeply coloured fruits and in ripening some two weeks earlier.
No. 92. Nectarine. A freestone variety obtained by M. A. Blake as a mutation from a chance seedling of the Elberta peach. The fruit is juicy and of very good flavour.
No. 94. Cherry. A late-ripening variant found by M. Gerber in an orchard. The fruit is well-flavoured and seems to be particularly good for preserving.

1596. Weeks, W. and Latimer, L. P. 634.11:581.162.3:581.162.5
Incompatibility of Early McIntosh and Cortland apples.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : 284–86.

McIntosh has been shown to be cross-compatible with its seedlings Melba, Milton, Cortland, Macoun and Early McIntosh and these seedlings are themselves cross-compatible with the exception of Cortland and Early McIntosh. Reciprocal cross-pollinations between these two varieties gave about the same set as self-pollinations or pollinations with King, a triploid variety.

Studies of pollen-tube growth and embryo-sac condition showed that Early McIntosh pollen on styles of Cortland and Cortland pollen on styles of Early McIntosh grew at about the same rate as pollen in compatible crosses during the first day, traversing about a quarter of the length of the style, but thereafter swelled up and grew more slowly or not at all. Disintegration of the embryo sac occurred in these incompatible crosses after seven days, but somewhat later in self-pollination of Early McIntosh. In compatible crosses two- or three-celled embryos were found seven days after pollination. J. L. F.

1597. 634.11:581.46:578.088.9
KRUMBHOLZ, G. 634.11:576.356.5
Beiträge zur Morphologie der Apfelblüte. II. Über die Eignung der Blütenmerkmale zur Sortenbeschreibung. **(Contributions on the morphology of the apple blossom. II. On the suitability of flower characters for describing varieties).**
Gartenbauwiss. 1939 : **13** : 1–65.

In the apple the flower characters are often better adapted for the description of varieties than are the vegetative organs or fruits. A classification scheme comprising 18 varietal groups is given with indications of how still further sub-division might be obtained. Descriptions of 31 varieties are given and the occurrence of petals with heart-shaped bases is noted as being specially frequent in triploid varieties of apples.

1598. HESSE, C. O. 634.21–2.421.6–1.521.6:575.1(79.4)
Variation in resistance to brown rot in apricot varieties and seedling progenies.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 266–68.

Observations on the relative resistance to brown rot of various apricot varieties grown at Davis, California are recorded. The reaction of various seedling progenies was also observed, but could not be explained on any simple genetic basis. The varieties St. Ambroise, Moorpark and Tilton appeared to transmit resistance to their progeny, while the variety Royal transmitted susceptibility to a marked degree. St. Ambroise is itself a rather susceptible variety, but in all cases its progeny were among the most resistant, regardless of the other parent. Tilton, a rather resistant variety gave very resistant progenies with Moorpark and St. Ambroise (more so than either parent), but when crossed with Royal gave progenies as susceptible as the latter parent. With Hemskirke the progeny were intermediate and with Wenatchee Moorpark they were more susceptible than either parent. Moorpark showed a similar variability of reaction in crosses according to the other parent used, but to a lesser degree than Tilton. Combinations of Hemskirke, Wenatchee Moorpark and Newcastle with other parents tended to give progenies of intermediate resistance.

1599. 634.22(47.9)
KOVALEV, N. V. 634.22:575.12:576.312.35
New species of plums.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 284–86.

New forms of cherry plum (*Prunus cerasifera*) from Iran are described having characters, such as pubescence of leaves, petioles and stones, not previously described as occurring in the genus *Prunus*. These forms are given the rank of separate species—*P. caspica* Kov. et. V. Ekim. and *P. iranica* Kov., both having a diploid chromosome number of 16.
Large numbers of natural hybrids between *P. cerasifera* Ehrh. and *P. spinosa* L. have been found which are triploid ($3x = 24$) and sterile. Hexaploid hybrids have also been found. A fertile intermediate form with 32 chromosomes has proved to be of hybrid origin and has been given the name *P. media* Kov. The wide cultivation of the first two of these new species is advocated. J. WILSON.

1600. 634.22:575.127.2
KOVALEV, N. V. 634.22:575.127.2:634.551
Ecological differentiation of the cherry plum *Prunus cerasifera* Ehrh. (s. l. Kov.).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 280–83.

A description of the morphological and ecological characters of various ecotypes of the cherry plum, *Prunus cerasifera* Ehrh., is given. A sterile triploid ($3x = 24$) hybrid between cherry plum and blackthorn found in the Caucasus has been classified as a separate species, *P. Rybini* Kov., and a fertile 32-chromosome hybrid has been named *P. media* Kov.
A hybrid between cherry plum and flowering almond (*Amygdalus ulmifolia* M. Pop.) named *Prunus silvestris* M. Pop. is characterized by greater cold resistance and grows at higher altitudes than the cherry plum. J. WILSON.

1601. MEADER, E. M. and
BLAKE, M. A. 634.25:575.127.2
Some plant characteristics of the progeny of *Prunus persica* and *P. kansuensis* crosses.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 287–91.
An outstanding feature of the F_1 hybrids *P. Persica* (var. J. H. Hale) x *P.* (*Amygdalus*) *kansuensis* was their rapid growth. The distinct light-grey network at the base of the sucker shoots typical of *P. kansuensis* was dominant, while in fruit bud pubescence the hybrids were intermediate between the glabrous *P. kansuensis* and the pubescent *P. Persica*. The hybrids had the early blooming habit of *P. kansuensis* but their flowers resembled those of *P. Persica*. The edible quality of the freestone fruits was low and the stones were intermediate in character. J. L. F.

1602. 634.25:576.356.5
634.25:576.356.52:581.481
PRATASSENJA, G. D. 634.25:581.162.51:576.312.36
Production of polyploid plants. Haploid and triploids in *Prunus Persica*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **22** : 348–51.
In the peach variety J. H. Hale nearly the whole of the pollen is aborted; wall formation after the last pre-meiotic mitosis fails and cells containing eight nuclei contained in a common wall were observed at the tetrad stage.
Continuing previous work (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 491), 150 further peach varieties were examined and the percentage of diploid pollen grains observed in some cases was very large (e.g. Khidistavsky No. 23, 12·81–35·98 per cent; New Prolific, 19·65 per cent). Pollinations with diploid pollen grains led to the production of seven triploid plants representing four different parental combinations. In addition, a seed with twin embryos was obtained from the cross involving the variety New Prolific pollinated with its own giant pollen. One of these embryos gave a haploid plant, the other a diploid and tetraploid chromosomal chimaera.
The ratio of the area of the stomata of haploid and diploid plants was 1 : 1·42, of diploid and triploid, 1 : 1·2.

1603. DERMEN, H. and
SCOTT, D. H. 634.25:576.356.5:581.04
A note on natural and colchicine-induced polyploidy in peaches.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : p. 299.
In some seedlings which had been subjected to heat and cold treatment as young zygotes a triploid was found. It was detected by stomata measurements and its triploidy was confirmed by root-tip counts. It is believed that it arose naturally, as doubling in the young zygote would be expected to give a tetraploid.
A tetraploid-diploid sectorial chimaera was found in a group of seedlings which had been immersed for four hours in 1 per cent. colchicine. This case was also detected by stomata measurements; root tip counts have only given the diploid number. J. L. F.

CITRUS FRUITS 634.3

1604. KLIMENKO, K. T. and
KLIMENKO, V. N. 634.3:575(47)
(Citrus breeding : for disciples of Michurin).
Izdanie Batumskogo Subtropičeskogo Botaničeskogo Sada (Batum Subtropical Botanical Garden) 1936 : No. 1 : Pp. 35.
Following the principles laid down by I. V. Michurin, crosses are made of the best quality cultivated forms with primitive forms possessed of some desirable feature such as hardiness, early maturity, etc. The following crosses are declared to be the most interesting:—(1) Kumquat x lemon (frost resistance, acidity); (2) Kumquat x sweet lemon (sweet skin,

large fruit); (3) Kumquat x Kaba lemon (large fruit, acidity); (4) Kumquat x *Citrus ponderosa* (large fruit, acidity); (5) Lemon x *Poncirus trifoliata* (frost resistance, acidity); (6) Clementine x orange (sweetness, earliness, free skin); (7) Orange x Shiva-Mikan (earliness, free skin); (8) Clementine x Natsu-Mikan (sweetness, large fruit); (9) Natsu-Mikan x Shiva-Mikan (earliness, large fruit); (10) *C. Unshiu* x orange (large fruit, keeping capacity, aroma). The technique of crossing is described. The seedlings are raised in the open rather than under glass, so as to harden them.

1605. Kandelaki, G. V. 634.3:576.312.35
(Karyological investigation of some cultivated species and varieties of the genus Citrus).
Trav. Inst. Bot. Tbilissi 1938 : **4** : 109–20.

Root tip counts were made in the following species: *C. nobilis Unshiu* Marc.; *C. n.* Shiva-mikan; *C. n.* kinzi-mikan; *C. n.* Natsu-mikan; *C. Aur.* Washington Navel; *C. Aur.* Jaffa; *C. Aur. Lumia pyriformis*; *C. Limonia* Monstruosa de lima, *C. Pomello*; *C. grandis* Osbeck, *Fortunella Nagami* (margarita) and *C. limonia ponderosa.* In all forms the somatic number $2n = 18$ was determined. The chromosomes were of three types and the idiograms of the different species are illustrated. Certain species, such as *C. grandis* Osbeck and *C. limonia ponderosa,* are characterized by much larger chromosomes than the rest.

1606. Chevalier, A. 634.322:576.16
L'origine botanique d'un agrume hybride: le Clémentinier. **(The botanical origin of a hybrid citrus : the Clementine).**
Rev. Bot. Appl. 1939 : **19** : 428–30.

A recapitulation of the data with regard to the origin of the Clementine (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1381 and Vol. VII, Abst. 770 and Vol. IX, Abst. 1607).

1607. Fauvel, J. H. 634.322:576.16
Quelle est l'origine exacte du Clémentinier? **(What is the exact origin of the Clementine ?)**
Rev. Hort. Agric. Afrique Nord 1939 : **43** : 62–65.

According to Dr Trabut the Clementine is a hybrid between the bitter orange and the mandarin. Professor Webber suggests that the evidence is in favour of a cross between a sweet orange and the mandarin. The author discusses briefly these two points of view while himself inclining to Dr Trabut's view and hopes to obtain conclusive proof by making the original cross.

1608. 634.37:581.163
Condit, I. J. 634.37:575(79.4)
Parthenocarpy in the fig.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 401–04.

Some varieties of the caprifig can set one and sometimes two crops by parthenocarpy; Croisic, an edible caprifig is completely parthenocarpic in one and sometimes both crops. In Smyrna figs parthenocarpy is found only to a limited extent in the first crop (breba) of certain varieties, while in the White San Pedro group the first crop is regularly produced by parthenocarpy whereas the second requires fertilization. In most of the common figs the first or both crops develop by parthenocarpy.

Breeding work on figs is in progress at Riverside, California and the seedlings raised there should give evidence on the inheritance of parthenocarpy in the fig. J. L. F.

NUTS 634.5

1609. 634.52:575
Evans, J. A. 634.52:576.356.5:581.04
Possibilities of producing better varieties of pecans than any in existence.
Proc. 18th Annu. Mtg Tex. Pecan Grs Ass. 1938 : 13–21.

It is suggested that great improvement may be made in the pecan by growing and selecting from large numbers of seedlings from nuts that are collected from trees of superior varieties

which have no inferior trees growing near to them. The author has several thousands of seedlings produced in this way; they show great variability and most of them have nuts of excellent quality.
In addition, it is possible that improvement may be effected by inducing polyploidy by colchicine treatment. Some of the plants treated in this way by the author appear to be chimaerical in nature but it is not yet known whether polyploidy has occurred.

1610. McKay, J. W. and
Crane, H. L. 634.53:575.183
The immediate effect of pollen on the fruit of the chestnut.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 293–98.
Data are presented to show that the pollen used has an influence on the weight of the chestnuts produced from hand pollinations. Since the nut is largely made up of embryo tissue, this is termed xenia. In all the cases investigated so far it has been found that pollinating a given tree with pollen from a tree producing large nuts gives larger nuts than pollinating with pollen from a tree producing small nuts.
Since most chestnut varieties and species are believed to be self-incompatible this phenomenon may have its commercial application. J. L. F.

1611. Kemularia-Nathadze, L. M. 634.54:575.12
(The arborescent hazel in Georgia and its hybrids).
Trav. Inst. Bot. Tbilissi 1938 : **6** : 1–24.
Descriptions, in Russian and Latin, are given of the indigenous Georgian species *Corylus iberica* Wittm. and of two natural hybrids of the species with *C. Avellana*. These two species, together with *C. Colurna* and certain others, are thought to be relics of a former species widely distributed prior to the ice age.

1612. Giessen, C. van der and 634.58:575.42
Govers, A. 634.58-2.3-1.521.6
De aardnootvariëteit Schwarz 21 en haar resistentie tegen slijmziekte.
(The groundnut Schwarz 21 and its resistance to slime disease).
Landbouw 1939 : **15** : 183–88.
Schwarz 21 is a line obtained by selection during 1921–1937 from populations of groundnut imported from Besoeki (Java) and known there as Soenda. It is resistant to slime disease and highly productive under widely different conditions of soil, climate, etc.
The importance and methods of maintaining adequate supplies of pure seed are discussed.

SMALL BUSH FRUITS 634.7

1613. 634.711:575(76.8)
Drain, B. D. 634.711:575.127.2
Red raspberry breeding for southern adaptation.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 302–04.
The Van Fleet variety, which is considered to be a cross between the variety Cuthbert and *Rubus kuntzeanus* is well adapted to the conditions of the southern United States but its fruit is low in commercial quality. Selfing this variety gave progenies highly susceptible to mosaic and with fruit of low quality. Back-crossing with commercial varieties such as Viking, Chief, Cayuga and Latham produced lines more resistant to mosaic but in general more susceptible to leaf spot (*Septoria Rubi* Westd.) and with fruit still of too low quality for the general market. Second back-crosses, using the variety Lloyd George gave some progenies with good quality fruit and, though many were discarded because of sterility or disease resistance, several have been good enough to send out for grower tests and at least one autumn fruiting selection is likely to be named and introduced. J. L. F.

1614. 634.711:581.163
PETROV, D. F. 634.711:575.127.2:634.714
On the occurrence of facultative pseudogamy in a triploid variety of raspberries, Immer tragende (*R. Idaeus*).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **22** : 352–53.

The raspberry variety, Immer tragende (Ever-bearing) proved to be a triploid ($3x = 21$). In the pollen mother cells 2–3 trivalents, 4–5 bivalents and 4–5 univalents were observed, and up to 90 per cent of the pollen was aborted. When emasculated and isolated the variety was sterile, but when pollinated with the diploid raspberry variety Marlborough several plants were raised which were all identical with the maternal parent Immer tragende and had 21 chromosomes. When crossed with the hexaploid *Rubus loganobaccus* variety Texas, however, Immer tragende gave true hybrids with 42 chromosomes, evidently the result of the fertilization of unreduced egg cells by normal pollen grains of Texas. Immer tragende therefore produces egg cells with the somatic chromosome number which may develop apogamously or may be fertilized normally, according to which male parent is used.
Macrosporogenesis has not yet been studied in the variety.

1615. WHITE, E. and
CLARK, J. H. 634.737:581.162.31
Some results of self-pollination of the Highbush Blueberry at Whitesbog, New Jersey.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 305–09.

It was found that self-pollination of several blueberry varieties gave as good a set as cross-pollination, with one exception, but the berries produced were smaller and ripened later than those produced by cross-pollination. J. L. F.

1616. DERMEN, H. and
DARROW, G. M. 634.75:576.356.5:581.04
Colchicine-induced tetraploid and 16-ploid strawberries.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 300–01.

Tetraploids have been produced from the diploid *Fragaria vesca* ($2n = 14$) and 16-ploids from the octaploid commercial variety Dorsett by immersing young seedlings in colchine solutions. Chimerical plants were also obtained by this treatment. Tetraploid tissue can readily be detected in *F. vesca* by morphological characters, but chromosome doubling in the Dorsett seedlings could only be detected by chromosome counts.
It is hoped that chromosome doubling may be produced in commercial varieties by treatment of runner tips. The authors now have $2n$, $3n$, $4n$, $5n$, $6n$, $8n$ and $16n$ strawberry plants.
J. L. F.

1617. 634.75–2.4–1.521.6:575.11
CLARK, J. H. 634.75:575.11.061.6
Prevalence of certain diseases affecting the foliage in some strawberry progenies.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 455–60.

Data are given on the incidence of leaf scorch (*Diplocarpon earliana*), mildew (*Sphaerotheca humuli*) and June yellows in hybrid strawberry progenies. Resistance to the first two diseases appears to be inherited in a rather complex manner. The variety Teddy Roosevelt often appeared in the ancestry of seedlings resistant to leaf scorch.
June yellows is believed to be genetic in origin. Evidence is presented to show that it is inheritable and that a potentially yellow seedling may remain green for two years or more. A yellow and a green open pollinated seedling of the yellow variety Van Dyke were used as parents and were both found to transmit yellowness, but the yellow seedling did so more strongly than the green. More than one gene is believed to be concerned in the inheritance of this character. J. L. F.

1618. Scherz, W. 634.835:575
Zur Züchtung der Rebe. (**Grape breeding**).
Wein u. Rebe 1938 : **20** : 329–39.

In a lecture delivered at the grape breeding congress on 27th September, 1938, the author outlines the work already described in "Plant Breeding Abstracts", Vol. IX, Abst. 401 on resistance to *Plasmopara*.
He also describes his work on phylloxera resistance. The methods employed are similar and when a clone is selected that combines resistance to both organisms it is used for back-crossing with the best European cultivated varieties. A number of pure *Vitis vinifera* strains possessed of resistance to phylloxera have now been obtained and a search is also being made for tolerant varieties.
In all breeding work the use of the F_2, as opposed to confining attention to the F_1, is recommended, provided that sufficiently large populations are employed.

1619. Breider, H. 634.835:575.1
Zur Genetik der Rebe. (**Genetics of the vine**).
Wein u. Rebe 1938 : **20** : 315–28.

The importance of genetical knowledge for successful breeding is emphasized. The autumn leaf coloration and the fruit colour are regarded as being dependent on the same gene, the absence of correlation in certain cases being occasioned by a special inhibitor that suppresses the anthocyanin formation in the leaves.
Examples showing the great susceptibility of characters in the vine to external and other influences are given; for instance the change in dominance with age of plant, the change in plant type that can be induced by soil, temperature, photoperiodism, etc. The frequent resemblance of modifications to mutations is referred to and attention called to the importance for breeding purposes of distinguishing between the two. Vegetative mutation is of frequent occurrence and some of the mutants are of practical interest.

1620. Scheu, H. 634.835–2.411.4–1.521.6:575.116.1
Die Verschiebung des phänotypischen Bildes einer auf *Plasmopara viticola*-Widerstandsfähigkeit selektionierten E x A F_2-Population. (**Shift in the phenotype of an F_2 European x American population selected for resistance to *P. viticola*).**
Wein u. Rebe 1938 : **20** : 340–48.

An F_2 of the hybrid Gamay x Riparia 525 Ob. consisting of several thousand plants was examined, part of the population having been selected for *Plasmopara* resistance and the other part being unselected. The selected section showed a more pronounced morphological resemblance to the European parent type than the unselected, though the two populations were grown under similar environmental conditions; the selected population contained a higher proportion of individuals with high acid content, foxy flavour and deep red juice. This correlation enables juice colour to be used as an indicator of acidity and foxy flavour.
It is thought that the correlation between resistance and undesirable flavour will ultimately be broken, making the production of desirable resistant vines possible.

1621. Breider, H. 634.835–2.7–1.521.6:519.241.1
Untersuchungen zur Vererbung der Widerstandsfähigkeit von Weinreben gegen die Reblaus, *Phylloxera vastatrix* Planch. I. Das Verhalten von F_3-Generationen, die aus Selbstungen von widerstandsfähigen und anfälligen F_2-Artbastarden gewonnen wurden. (**The inheritance of resistance of the vine to *P. vastatrix* Planch. I. The behaviour of F_3 generations which were obtained from selfings of resistant and susceptible F_2 species hybrids).**
Z. Pflanzenz. 1939 : **23** : 145–68.

From an analysis of F_2 segregations and F_3 correlations of *Vitis vinifera*, *V. rupestris* and *V. riparia* crosses it is considered that no general Mendelian scheme of inheritance holds for resistance to *P. vastatrix*.

A true correlation between seedling growth and leaf and root resistance is shown, and correlations between leaf characteristics and leaf or root resistance are believed to be fortuitous.
J. C. C.

FORESTRY 634.9

1622. Minckler, L. S. 634.97:575.1
Genetics in forestry.
J. For. 1939 : **37** : 559–64.
The author outlines the present state of knowledge on local races in forest trees, stressing the importance of recognizing this knowledge when planting up new forests, and he refers to work now in progress in producing improved strains of various trees, especially as regards disease resistance. A number of characters known to be hereditary are enumerated.

1623. Jentys-Szaferowa, J. 634.972.6:575.12(43.8)
Z badań biometrycznych nad zbiorowym gatunkiem *Betula alba* L. II. O możliwości krzyżowania się, gatunków *Betula verrucosa* Ehrh. i *Betula pubescens* Ehrh. (**Biometrical studies on the collective species *B. alba* L. II. The possibility of hybridization between species *B. verrucosa* Ehrh. and *B. pubescens* Ehrh.**)
Rozprawy i sprawozdania, Inst. Badawczy Lasów Panstwowych, Warszawa 1938 : No. 40 : Ser. A : Pp. 84.
The author concludes from a study of the amount of *Betula verrucosa* and *B. pubescens* pollen in the air throughout the flowering season in the forest of Wola near Cracow that *B. verrucosa* stands a very slight chance of being pollinated by pollen other than its own. *B. pubescens*, however, flowers about 10 to 12 days later at a time when there is still *B. verrucosa* and hybrid pollen in the air, so that the crosses *B. pubescens* x *B. verrucosa* and *B. pubescens* x (*B. pubescens* x *B. verrucosa* F_1) may take place.

1624. Stockwell, W. P. 634.975:581.162.4:575.42
Pre-embryonic selection in the pines.
J. For. 1939 : **37** : 541–43.
At the entry of the pollen into the pollen chamber of the ovule and of the pollen tubes into the ovule, during the period of one year before fertilization is effected, at the time of fertilization of the archegonia and of development of the proembryos, only one of which finally persists—at all these stages some sort of natural selection is operative and a study is now being made to investigate the possibility of controlling it.

VEGETABLES 635

1625. W....., P. 635:575:007(79.4)
Ivan Claude Jagger.
Market Gr. J. 1939 : **64** : p. 180.
This obituary notice contains an account of the contributions of Dr Jagger to vegetable breeding, the most important of which were the production of the Mildew Resistant 45 muskmelon and of strains of crisp-head lettuce resistant to brown blight and mildew.

1626. Lachman, W. H. 635.13:575.061.1
A quantitative study of form and size in five varieties of carrots.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 623–25.
By growing five varieties in a Latin Square it was shown that it is possible to find significant difference in their root shape. Root volume was much more influenced by soil variability than shape.
J. L. F.

1627. Stolei, V. Ja. 635.15:575(47)
(The Chinese radish).
Ovoščevodstvo (Vegetable Growing) 1939 : No. 4 : p. 31.
A brief note on the Chinese radish. The numerous local populations and forms in the Far

East region have been used by the Far East Experiment Station of the All-Union Institute of Plant Industry in breeding two new varieties of which the better, Chinese No. 2, is described. It is a late form, keeps well and has a high yield and a good flavour.

1628. 635.25:575

HAWTHORN, L. R. 635.25:575.11.061.6

Behavior of certain characters in breeding Yellow Bermuda onions.

Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 668–73.

It is shown that by inbreeding and selection it is possible to modify the incidence of double bulbs and bolters in lines of Yellow Bermuda onions. A line has been produced which seems entirely free from these defects, though it has lost vigour.

Segregation for bulb colour into 3 yellow: 1 white was observed in the selfed progeny of two plants. J. L. F.

1629. 635.25:575:578.08

JONES, H. A. 635.25–2–1.521.6:575(73)

Onion breeding.

Market Gr. J. 1939 : **64** : 53, 56.

Much of the onion breeding work in the United States has been done at Davis, California. The method recommended for improvement of the yield and uniformity of a variety is to select at least 200 bulbs of the desired type and to inbreed each. Undesirable lines are discarded. A few of the best bulbs from each selected line are grown on and further inbred, while the remainder are grown together and allowed to intercross, giving a quantity of hybrid seed for use in trials. Inbred lines cannot be used directly as commercial varieties, since they show loss of vigour.

As a result of extensive trials, lines resistant to most of the major pests and diseases of onions have been discovered, and these are being used in crosses. Two varieties, White Persian and an *Allium fistulosum* variety, Nebuka, are highly resistant to thrips. Nebuka also possesses very high resistance to smut and to pink-root. It can be used as a parent in crosses with very early maturing varieties of onion, but hybrids with later varieties are difficult to obtain and are nearly all sterile.

Two lines resistant to downy mildew were discovered at Davis, and they have been used in crosses with other varieties. These mildew-resistant forms and their resistant progenies have also proved to be highly resistant to purple blotch.

With regard to onion smudge, a storage disease to which white types are particularly susceptible, there is some evidence that resistant types exist and further research is being conducted.

A technique has been developed for raising blowflies for use as pollinators.

1630. LEVAN, A. 635.26:576.356.2:581.331.2

Amphibivalent formation in *Allium cernuum* and its consequences in the pollen.

Bot. Notiser 1939 : 256–60.

An interchange ring of four chromosomes (an "amphibivalent") was observed in a plant of *A. cernuum*. This ring segregated nondisjunctionally in about 50 per cent of cases. At telophase II and in the young pollen 11·5 per cent of cells had 2–4 micronuclei instead of a single nucleus, and it seems probable that this condition is a genetic effect of the deficiency occurring in only one of the four expected types of deficient gamete, on which basis the expected frequency of multinucleate cells is 12·5 per cent.

1631. YEAGER, A. F. and

SCOTT, D. H. 635.31:577.8:581.149

Studies of mature asparagus plantings with special reference to sex survival and rooting habits.

Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 513–14.

A 35-year-old planting of asparagus had 2·5 staminate plants to each pistillate, indicating

that the staminate plants are longer lived. It was noted that the average staminate crown was bigger than the average pistillate.
In another experiment the larger yield of staminate plants (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1419) was confirmed. J. L. F.

1632. HANNA, G. C. 635.31–1.557:575
Yield studies as related to asparagus breeding.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 677–79.
Some data are given bearing on the problem of how many years of trial are necessary before the performance of an asparagus plant with regard to yield can be assessed. Though in general plants which yield well at first continue to do so there are marked exceptions and it is considered that records should be taken for 7 or 8 years to avoid using short-lived plants as parents. It is not yet known, however, to what extent length of life is inherited in asparagus.
J. L. F.

1633. THOMPSON, R. C. and KOSAR, W. F. 635.52:576.356.5:581.04
Polyploidy in lettuce induced by colchicine.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 641–44.
By soaking seeds of the Grand Rapids variety of lettuce in 0·1 per cent colchicine solution three tetraploids were obtained, having $n = 18$ chromosomes in their pollen mother cells. These set only a few seeds, which all gave tetraploid plants. The latter were also less self-fertile than normal diploids, but varied considerably in this and other respects. Since the strain of Grand Rapids used is very homozygous this variability is unexpected.
Other types of colchicine treatment were tried and it is mentioned that the treatment of meristems on older plants was not very successful. J. L. F.

1634. SEATON, H. L. and KREMER, J. C. 635.61/3:581.162.3.056
The influence of climatological factors on anthesis and anther dehiscence in the cultivated cucurbits. A preliminary report.
Proc. Amer. Soc. Hort Sci. (1938) 1939 : **36** : 627–31.
Temperature was shown to be the most important climatological factor influencing anthesis and anther dehiscence in cucurbits, humidity being without evident effect. The minimum and optimum temperatures for anthesis and anther dehiscence in pumpkins and squashes, watermelons, gherkins and cucumbers, and cantaloupes and winter melons are given.
It is suggested that temperature observations will be helpful in making artificial pollinations. The activity of bees in the flowers in the early morning was found to be a good indicator of the stage of anther dehiscence. J. L. F.

1635. 635.61/2:575(47)
(Cultivation of cucurbits in the U.S.S.R. Breeding, seed production, cultivation and mechanization of cucurbits).
Lenin Academy of Agricultural Sciences, Moscow 1939 : Pp. 99.
The bulletin consists of a series of articles of which the following may be of interest to plant breeders.
Pangalo, K. I. (*Survey of the breeding work with cucurbits in the U.S.S.R. and abroad*). (*pp. 30–39*).
Many of the new forms of melons and other cucurbits discovered in Central Asia have proved valuable for direct introduction into certain areas of European Russia; others have produced valuable forms after a few generations' selection. Others again have been used with success in hybridization; e.g. the Afghan bush melon has given rise to hybrids of bushy habit but with edible, juicy, sweet fruits. *Cucurbita mixta* has been used with success in producing hybrids of table or forage gourds with a large yield of oil seeds. The importance of preserving the ancient forms by adequate collections is therefore self-evident. The Soviet Union is rich in varieties of water-melon, which though of a different type from the American varieties

are none the less valuable; the varieties of melon and gourds are much more limited; in these latter two crops progress can be made by simple introduction of foreign strains.
Reference is made to the best strains of the various cucurbitaceous plants produced by Soviet breeding and to some of the defects in this breeding work.

Goldhausen, M. K. (*New developments in breeding cucurbits*). (*pp. 39–44*).

The wild water-melon, *Citrullus Colocynthis* Schrad, is characterized by unusual resistance to drought and heat, large number of fruits per plant (15–20 and even up to 50) and exceptional keeping capacity of the fruit. It crosses only with difficulty with the cultivated water-melon and the F_1 hybrids are entirely of the wild type, as are the great majority of the F_2, though variation occurs in the quantities and proportions of bitter glucosides and sugars. The F_2 plants with the least bitter fruits produced F_3 families containing certain plants free from bitterness with sugar contents up to 6·75 per cent. Some of these proved to be quite drought resistant and even when grown unprotected in the windy desert produced a quite good yield of fruit. Being late in maturity and deficient in sugar content, they were crossed with suitable cultivated forms and thoroughly satisfactory hybrids are now being produced. Some of the F_3 and F_4 fruits were capable of being kept over two months in the heat without being damaged, in conditions that ruined the ordinary water-melons in less than 10 days. They were then sent to Leningrad and kept in good condition until February. Others of the hybrids bore as many as 17 fruits, with a total weight of 40 kg., of quite satisfactory quality. Similar increases in fruit number were observed in crosses between cultivated gourds and ornamental forms with inedible fruits, some hybrids having as many as 40 fruits per plant.
By crossing between the three main subspecies of gourds bush forms with large fruits have been produced and also very early forms ripening at the beginning of August.
Various early maturing and winter melons have been produced by crossing varieties belonging to different subspecies; also cantaloupes with firmer flesh of improved flavour, and bush melons with fruit of good flavour.

Arasimovič, V. V. (*The importance of chemistry in breeding cucurbits*). (*pp. 44–52*).

The sugar content in water-melons varies from 7 to 11 per cent and in musk-melons can reach as much as 12 per cent; the water-melons contain a higher proportion of fructose, the musk-melons a higher proportion of sucrose and also of vitamin C. The wild and semi-cultivated species are much lower in total sugar content and in sucrose in particular.
In most melon and water-melon hybrids the sugar content was intermediate between that of the two parent varieties; in some there was an increase in sugar content and in others a decrease; the F_2 segregation showed glucose, fructose and sucrose content to be inherited independently. Sugar content was also independent of earliness, indicating the possibility of obtaining early forms of good quality.
Similar results were obtained in interspecific crosses; hybrids between *Citrullus edulis* and *C. colocynthoides* had very much reduced pectin contents, showing the possibility of improving the quality of the latter species for forage purposes by interspecific crossing.
In the ordinary water-melon the sugar content attains a maximum at maturity and falls during keeping owing to respiration; in the forage forms this fall during keeping does not occur, and by crossing the two it has been possible to produce table water-melons with greatly increased keeping capacity.
Winter melons that improve their quality with keeping have also been found.

1636. Ervin, C. D. 635.61:576.356.5:576.312.38
Polysomaty in *Cucumis Melo*.
Proc. Nat. Acad. Sci., Wash. **1939** : **25** : 335–38.

Polysomaty (the production of somatic nuclei with multiples of the normal somatic chromosome number) was found to be a regular occurrence in the periblem of primary and secondary roots of four varieties of *C. Melo*. It was rare in the plerome. Disomaty was the more frequent condition, but tetrasomatic cells were also found.
In some polysomatic nuclei all the chromosomes were paired, but in others there was little or no somatic pairing.

1637. Ekinci, A. S. 635.61–1.524.4(56)
Garbî Anadolu ve Trakya mintakalarinda Kavun ve Karpuz ziraati ve çeşitleri hakkinda ilk rapor. (**First report on the agriculture of melons and water-melons and their varieties in the districts of Western Anatolia and Thrace**).
T.C. Ziraat Vekâ leti Neşriyati. Yüksek Ziraat Enstitüsü Neşriyati. Çalişmalardan sayi: (Publications of the Ministry of Agriculture of the Turkish Republic. Publications of the Institutes for Higher Studies in Agriculture) 1937 : No. 76 : Pp. 48.

The melons and water-melons produced in Turkey are declared to be the finest in the world. Morphologically and physiologically considered, the melons form two groups (1) the Adana group and (2) the Cassaba group, representing two proles of the sub-species *cultus* of *Cucumis Melo*. The fruits of the first group, which includes the varieties Topatan Kavunu, Sari Kavun and Istanbul Kavunu, ripen very early, have thin rinds and are circular or elliptical in shape. The rind, which may be either smooth or rough, ranges from whitish yellow to dark brown. The flesh is yellow or orange and smells like the pineapple. Their delicate rind makes them unsuitable for transportation.

The second group includes the varieties Altin Bash kavunu, Yeşil Hassan bey kavunu, Uzunköprü kavunu, Çiltili kavunu, Hassan bey kavunu and Dilimli kavunu which are rather large with smooth or rough rinds. They are very sweet but not by any means equal to the Adana melons in various qualities.

The finest varieties of melons are: Kiragaj, Kirsiz almaz, Turgutlu, Altin bash (izmir) and Uzun köprü (from Thrace).

The water-melons most commonly grown are the round and oval-round forms. In Thrace and Anatolia the fruits weigh about 2–15 kg. The finest and best known varieties of water-melons are: Ghermendjik (Aegean region) Turgutlu; Diyarbakir and Yeni Dünya (Thrace and Tekirdag).

1638. Goldhausen, M. 635.615:575.127.2
Interspecific hybrids in water-melons.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1938 : **20** : 595–97.

Direct and reciprocal crosses were made between the water-melon species *Citrullus edulis*, *C. colocynthoides*, *C. Colocynthis* and *C. fistulosus*. The results showed that *C. colocynthoides*, the fodder water-melon, was most closely related to *C. edulis*, the wild *C. Colocynthis* showing a slightly less close relationship to that species. In both these cases the hybrids were normal in vigour and fertility. *C. fistulosus* showed appreciably lower crossability with *C. edulis* and the hybrids were reduced in vigour.

In general, the characters of the less cultivated or wild parent showed dominance in the F_1 plants. Heterosis was observed in some cases.

Hybrids of *C. edulis* and *C. fistulosus* showed matroclinous inheritance for the majority of characters.

In the F_2 and F_3 of certain crosses, a few entirely new characters appeared, e.g. new colours of flesh in *C. edulis* x *C. colocynthoides* and very large leaves in *C. edulis* x *C. Colocynthis*. The F_2 segregations were complex and were not analysed in detail.

Several of the crosses indicate the possibility of breeding new types of commercial importance. From *C. edulis* x *C. colocynthoides* crosses, edible forms with firm flesh of improved keeping quality and fodder-type plants with sweeter and more tender flesh may be obtained.

In this combination, nearly all the F_2 progeny are bitter and experiments must be conducted on a large scale if sweet forms are to be obtained. Among the non-bitter forms occurring in subsequent generations were some which approached the colocynth in leaf characters and habit and proved to be cultivable in desert conditions in which ordinary water-melons could not be grown. Edible and fodder types with 10 to 15 or even more fruits per plant instead of the usual 3 to 5 were also obtained.

The species *C. fistulosus* is valuable for breeding purposes only when crossed with *C. colocynthoides*, the fodder qualities of which it may improve by reducing the percentage of pectic materials and increasing the number of fruits per plant.

1639. Pangalo, K. I. 635.615–2.112–1.521.6:575.127.2
(Concerning hybrid synthesis of new exceptionally drought-resisting varieties of table water-melon).
Priroda (Nature) 1939 : No. 6 : 61–64.
A description is given of the wild desert plant *Citrullus Colocynthis*; the chief cause of its exceptional drought resistance is thought to be its extensive root system. Although in chromosome number it is the same as the cultivated water-melon, *C. edulis*, crosses between the two species were difficult to effect. The hybrid in nearly all characters resembled the wild species and though segregation occurred in the F_2 the wild characters still predominated. Seeds were taken from the most promising segregates but no cultivated forms were obtained even in the F_3–F_5 generations and the F_5 plants were back-crossed with *C. edulis*. This produced forms of the cultivated type, some of which proved to be almost equal to the wild species in drought resistance.
It is thought possible that other wild species still more suitable for crossing with cultivated water-melons may exist in certain parts of Africa.

1640. Curtis, L. C. 635.62:575(74.6)
Connecticut Straightneck. A new, early, productive summer squash.
Circ. Conn. Agric. Exp. Sta. 1938 : No. 119 : Pp. 7.
The new variety was selected after nine years of inbreeding from the cross between Giant Summer Crookneck and an inbred straight-necked strain obtained from Dr. E. W. Sinnott. It has been the highest yielding early strain in trials in Connecticut for six years.

1641. Seaton, H. L. and
Kremer, J. C. 635.62:581.162.3:581.46
The relation of certain floral abnormalities to the pollination of *Cucurbita*.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : p. 626 (Abst.).
A brief description is given of certain floral abnormalities making the nectaries inaccessible to insects. It is suggested that these abnormalities might be eliminated by selection. J. L. F.

1642. Hutchins, A. E. 635.63:575.125"793"
Some examples of heterosis in the cucumber, *Cucumis sativus* L.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 660–64.
Crosses were made between the pickling variety Mincu and the slicing varieties Straight-8, Davis Perfect, Longfellow, Early Fortune, Shamrock, Arlington White Spine, Colorado, Japanese Climbing and Improved Long Green. The F_1 hybrids and the parent varieties were planted in four randomized blocks and fruits were harvested at about 6-day intervals when they reached marketable size. The data were analysed with respect to yield per plant, yield at the different harvestings, number of fruits per plant and average weight per fruit. Hybrid vigour was found to be manifested in increased yield per plant and number of fruits per plant. Most of the difference in yield was produced in the first half of the pickling season, possibly owing to the earliness of Mincu. No difference in yield per plant was found in reciprocal crosses.
The possibility of applying these findings to commercial practice is considered. J. L. F.

1643. Bailey, R. M. 635.63–2.484–1.521.6:575.11
Progress in breeding cucumbers resistant to scab (*Cladosporium cucumerinum*).
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 645–46.
Several American, English, German, Brazilian, Indian and Turkish varieties have been tested for scab resistance by artificial inoculation but none have shown resistance.
Further work has confirmed the hypothesis (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 298) that resistance is chiefly due to a single factor, the dominance of which is possibly incomplete.

No evidence of physiological strains of the parasite has been found.
It is believed that no interference in breeding resistant forms is likely to arise from linkage between resistance and fruit characters.
A resistant selection, Maine No. 2, has been released for home garden use. It has black spines, short to medium fruits and matures in midseason. It is unsatisfactory for market and more promising selections are under trial for this purpose. J. L. F

1644. Smith, K. 635.64:575(74.9)
The Rutgers tomato.
N.J. Hort. Soc. News 1939 : **20** : p. 1127.
The variety is best described in the author's own words:

"Bro't to bear with patient care
By Professor Schermerhorn,
"Rutgers" is a heavy cropper,
All that such a fruit can be.
Chosen out of many thousands,
Tested under all conditions,
This tomato comes from Marglobe
Interbred with J.T.D."

1645. 635.64:575(77.6)
Currence, T. M. 635.652:575(77.6)
The Mingold tomato and the Duluth snap bean.
Market Gr. J. 1939 : **64** : p. 216.
Bred at the Minnesota Agricultural Experiment Station, the Mingold tomato is a yellow-fruited strain to the ancestry of which an unnamed variety and the varieties Viking, Bonny Best and Danish Export have contributed. It compares favourably with Marglobe in many characters and is a considerable improvement on older yellow-fruited types.
The Duluth bean resulted from the repeated back-crossing of white-podded selections to the variety Brittlewax in order to produce a bean of the Brittlewax type with white pods. Although Duluth resembles Brittlewax in many characters, it has a shorter pod and one which is flatter in cross-section. It is of high cooking quality and attractive appearance.

1646. Brežnev, D. D. 635.64:575.12:575.148
(Intravarietal crossing as a method of increasing yield in tomatoes).
Ovoščevodstvo (Vegetable Growing) 1939 : No. 6 : 38–41.
Seed from intravarietal crosses was compared with normal seed in six different varieties. The seedlings produced were more vigorous, the young plants were larger, more vigorous and more deeply pigmented. At maturity the plants were taller, by 11–21 per cent. The increase in yield varied in different varieties; it also differed in different regions and it is recommended that a mixture of pollen from as many varieties as possible be used, to prevent loss of yield owing to the absence of the ideal parental combinations.
The crossed plants were also earlier in maturity and their fruits were of a higher quality. The author expresses the opinion that seed from intravarietal crossing is preferable to seed from crossing different varieties because it maintains its characteristics in later generations.

1647. Kul'čenko, N. I. 635.64:575.12:575.148
(Intravarietal crossing of tomatoes in the greenhouse).
Ovoščevodstvo (Vegetable Growing) 1939 : No. 6 : 41–42.
The plants from crossed seed of the varieties Bison and Best-of-all were higher in yield by 13·6 to 40·9 per cent, matured 2–9 days earlier and were more healthy and vigorous.

1648. Lesley, J. W. and 635.64:581.162.51:581.331.2:575.113.4
Lesley, M. 635.64:575.116.1
Unfruitfulness in the tomato caused by male sterility.
J. Agric. Res. 1939 : **58** : 621–30.
Male-sterile plants occurred in the progeny of a simple trisomic plant having an extra *H* (IV)

chromosome. The pollen produced is nearly normal in amount, but its development is arrested. Unlike normal pollen, the grains contain starch at dehiscence. A small proportion of grains of normal appearance is produced, but apparently they do not function. This male-sterile condition occurs in plants homozygous for two recessive genes, ms_1 and ms_2. In the progeny of male-sterile x male-fertile crosses 15 : 1 and 3 : 1 ratios were obtained. In one case an apparent 7 : 1 back-cross ratio suggested that a third gene may also be involved in some cases. It is suggested that the presence of a small proportion of unfruitful plants in commercial plantings of tomatoes may be due in part to the segregation of male-sterile recessives. These could be eliminated by testing large progenies of single plants and eliminating those which gave male-sterile segregates.
Tests involving the ms_1 and ms_2 genes and several others failed to establish any significant linkages. It was, however, determined in the course of the work that the gene *c* (potato-leaf) is in chromosome IV (*H*).

1649. Butler, H. F. 635.64–1.524:575(76.8)
Tomato importations for breeding.
Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 674–76.
Brief notes are given on *Lycopersicon* introductions from South and Central America, Mexico, Asia and Morocco. Altogether 282 different lots have been grown but only 5 have been selected as parents possessing characters of value under Tennessee conditions. Of these 4 are as yet undetermined species from Peru and undesirable commercial types, the remaining one being a *L. esculentum* type from Argentina with fruit of excellent quality. All these 5 types have shown resistance to diseases. J. L. F.

1650. 635.64–2.48–1.521.6:575(73)
Caldwell, R. M. 635.64:575.127.2
Breeding disease resistant tomato varieties. I. For the Middle West and East.
Canner 1939 : **88** : No. 12 : Pt. 2 : p. 87.
Wilt-resistant tomato strains adapted to most of the tomato-producing regions are now available. The more recent work has led to the production of varieties well suited to particular areas and market requirements but with no greater resistance to *Fusarium* than the early resistant forms.
Several experiment stations are using *Lycopersicon pimpinellifolium* in crosses in order to make use of its greater resistance to *Fusarium* wilt and to *Cladosporium* leaf mould. Some other *Lycopersicon* species recently introduced from South America may be of use in obtaining resistance to *Septoria* and *Macrosporium*.

1651. Huelsen, W. A. 635.64–2.484–1.521.6:575(77.3)
Wilt-resistant tomato varieties released by the Illinois Station.
Circ. Ill. Agric. Exp. Sta. 1939 : No. 490 : Pp. 22.
Four varieties of field tomato and five greenhouse types, all resistant to *Fusarium* wilt and bred at the Illinois experiment station, are described and illustrated.

1652. Bohn, G. W. and
Tucker, C. M. 635.64–2.484–1.521.6:575(77.8)
Immunity to *Fusarium* wilt in the tomato.
Science 1939 : **89** : 603–04.
Tests of several wilt-resistant tomato varieties showed that they all succumbed to the disease under conditions very favourable for its development. A search for more effective resistance was therefore made, and a form of *Lycopersicon pimpinellifolium* obtained from Peru was found to be completely immune. This form, Accession 160, has been shown to contain a single dominant gene for immunity. By repeated back-crossing to *L. esculentum*, homozygous immune, large-fruited forms have been obtained and are being selected for desirable fruit and plant characters.

1653. 635.64–2.484–1.521.6:575(79.2)
635.64–2.8–1.521.6:575(79.2)
635.64–1.524

Blood, H. L.

Breeding technique for disease-resistant tomatoes. Study of suitable plant varieties for Pacific Coast and Intermountain States.

West. Cann. Pack. 1939 : **31** : No. 2 : p. 50.

Blood, H. L.

Breeding disease-resistant tomato varieties for the Intermountain States and the Pacific Coast.

Nat. Cann. Ass., Washington, D.C. January 25, 1939 : Pp. 2. (Mimeographed).

Blood, H. L.

Breeding disease resistant tomato varieties. 2. For the Intermountain States and Pacific coast.

Canner 1939 : 88 : No. 12 : Pt. 2 : 87–88.

Some 19 selections of tomato, of South America, Mexican and hybrid origin, have shown resistance to curly top in trials in Utah, and an intensive breeding programme is being carried out to transfer this resistance to commercial varieties.

Some resistance to *Verticillium* wilt has been incorporated in the Riverside tomato, bred in California. A very high degree of resistance to the disease has now been found in a Peruvian wild tomato and attempts to transfer it to commercial varieties are being made, while a search for further resistant types is being made among recent introductions from South America. Types resistant to spotted wilt and practically the equal of Marglobe in other respects have been obtained by Dr D. W. Porter in the F_6 of the cross *Lycopersicon pimpinellifolium* x Marglobe. Resistant types other than *L. pimpinellifolium* are also being sought for use as parents.

No appreciable degree of resistance to mosaic is yet known; it is hoped that resistant types may be found among recent introductions from Bolivia, Argentina and Chile.

The forms introduced from South America belong to two groups, red-fruited (*L. esculentum*, *L. Humboldtii*) and green-fruited (*L. hirsutum*, *L. chilense*, *L. peruvianum*, perhaps *L. agrimonaefolium*, and certain unidentified species). Of the green-fruited group, *L. peruvianum* is highly resistant to *Fusarium* wilt, *L. hirsutum* possesses a greater degree of resistance to curly top than other species, and one of the doubtful species has shown resistance to leaf spot diseases. The value of these types in the breeding programme remains to be demonstrated.

1654. 635.652:581.163.32
635.653:581.163.32

Barrons, K. C.

Natural crossing in beans at different degrees of isolation.

Proc. Amer. Soc. Hort. Sci. (1938) 1939 : **36** : 637–40.

Contrasting pairs of varieties of both the lima bean (*Phaseolus lunatus*) and the common bean (*P. vulgaris*) were grown in rows, 1, 2, 3, 5 and 9 yards apart, the variety carrying the dominant tester gene being grown at an equal distance on either side of the variety carrying the recessive. In the lima beans Henderson's Bush was used as the female parent and Sieva as the male, the twining habit of the latter being dominant over the dwarf habit of the former. The percentage of twining plants found in the progeny of the Henderson's Bush varied between 5·03 per cent from the 1-yard spacing and 1·10 per cent from the 9-yard spacing.

The common bean varieties used were Alabama No. 1 and Alabama No. 18, differing only in the lighter anthocyanin pigmentation of the latter which is thought to be derived by a recessive mutation from the former. Cross-pollination here varied from 8·26 per cent in the 1-yard spacing to 2·63 in the 9-yard spacing.

These figures are larger than those reported by other workers (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1045) and this may be due to the greater numbers of bees and thrips at Auburn, Alabama, where these tests were performed. J. L. F.

1655. Barrons, K. C. 635.652–2.6–1.521.6:575(76.1)
Breeding better beans for south. Alabama tests a variety which outstrips all current market favorites.
Sth Seedsman 1939 : **2** (2) : p. 4.

The new pole bean (*Phaseolus vulgaris*) variety, Alabama No. 1, is resistant to the root-knot nematode, to some forms of bean rust and to drought. In trials it has very significantly out-yielded standard varieties, particularly on poor soils. Its pods have a purple pigment that disappears on cooking. The variety is not entirely stringless and may be most suited to home garden use.

Two further new strains, not yet released have also been developed at the Alabama Agricultural Experiment Station. Alabama No. 18 is similar to No. 1 but lacks the purple pigment in the pods. Alabama 25 is not so highly resistant to root-knot but is stringless and of the finest quality.

1656. 635.652–2.8–1.521.6:575(79.6)
Agricultural research in Idaho. No. 1 of a series. Beans that resist mosaic and curly top.
News Lett., Idaho 1939 : **22** : No. 3 : p. 1.

Earlier work resulting in the production of bean varieties resistant to common bean mosaic is briefly reviewed. At present, efforts are being made to produce varieties that combine resistance to mosaic and to curly top. This aim has already been attained in the case of Red Mexican beans by the introduction of the varieties Red Mexican U.I. No. 3 and Red Mexican U.I. No. 34. Resistant strains of the Great Northern, Red Kidney, Pinto and other varieties of field beans have now been selected from hybrid populations grown at Buhl, Idaho. These are now being tested further prior to release.

1657. Stepanoff, P. 635.655:575.243:537.531
(The action of X-rays on seeds of soya bean).
Trav. Jard. Bot. Univ. Moscow 1937 : **1** : 71–96.

Various cases of the production of desirable mutants are cited, including some giant cotton plants obtained by the central cotton breeding station, some characterized also by high boll yield and early maturity, others by a crowding of the nodes on the sympodial branches, resulting in the production of a greater number of bolls per branch.

Seeds of a variety of *Glycine hispida* ssp. *stricta* var. *vulgaris* were subjected to doses of X-rays varying from 1,260 r to 9,072 r after soaking for periods varying from 2 to 24 hours. The maximum receptivity was reached after soaking for 12 hours. The combined action of X-rays and various chemicals was found to be different from that of either alone; the effect of the chemicals was in most cases to reduce the number of mutants produced.

The mutant types obtained are described; they comprise various leaf anomalies, delayed or inhibited development of the growing point, sterility, dwarfness, chimaeras and fasciation of various organs, including ovules. Among the forms with stem fasciation it is hoped to find individuals bearing pods only in the upper half of the plant, a type that would have distinct practical advantages for mechanical harvesting; such types are usually characterized also by more uniform maturity.

A further curious type consisted of plants with small adventitious leaflets growing out of the cotyledons. Three such plants were found.

1658. 635.656:575.12
Enin, T. K. 635.656:575.2
(Hybridization of peas in breeding new varieties).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 2–3 : 32–35.

The main part of this paper, which deals with crosses between closely related geographical races of peas and crosses between distantly related strains, has been included in publications already reviewed (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 543 and 1249). The F_3 of the Gigant x Alaska cross still showed very varied segregation.

About 100 morphologically different types of peas have been isolated and described, some of which have useful, heritable characteristics, such as short vegetative period with sugar pods or edible pods, types with a large number of pods and a medium early vegetative period up to flowering time, resistance to lodging and drought.

1659. Walker, J. C. 635.656–2.4–1.521.6:575(73)
Disease resistant pea varieties.
Canner 1939 : **88** : No. 12 : Pt 2 : p. 89.

A considerable number of varieties suitable for canning and resistant to common wilt are now available, but new resistant types are needed for the freezing industry.
High resistance to the disease known as near-wilt has so far only been found in two unimportant canning varieties, Rogers K and Horal. These may be used as parents in crossing.
The problem of breeding types resistant to root rot is highly complex owing to the fact that any one of several different organisms may produce the disease.

1660. Pavlova, A. M. and
Kozak, M. P. 635.657:575
(Breeding gram).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 1 : 19–21.

In view of the defects of most of the local populations of *Cicer arietinum* in the U.S.S.R. attempts should be made to breed tall, early, disease resistant varieties with a high yield, an erect habit and light-coloured seeds with a high protein content.
Descriptions are given of the different classes of experimental material available from the resources of the All-Union Institute of Plant Industry which has carried out preliminary studies of the various ecological and geographical types.
The economically desirable and undesirable features of the various groups as breeding material are discussed.
Crosses made by the above Institute have yielded some promising forms in the F_3 and at the Krasnodar Experimental Station too some good types resistant to *Ascochyta* have been developed.
The technique of crossing gram is discussed in detail.

1661. 635.67:575.14(77.5)
Albright, J. L. 635.67.00.14(77.5)
Sweet corn hybrids and inbreds – results of canning and variety tests in Wisconsin.
Canner 1939 : **88** : No. 12 : Pt 2 : 88–89.

Details are given of trials involving eight yellow and seven white strains.
A large number of inbred lines are being established for producing new hybrids of the yellow type and also a white Country Gentleman hybrid.

1662. Stoletova, E. A. 635.75:575
(The geographical groups of coriander as initial material for breeding).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 5 : 12–13.

Extremely early forms capable of maturing in the neighbourhood of Leningrad have been found in some countries; they are however inferior in yield and oil content to the later maturing forms. Certain forms from Russia and neighbouring countries are free from the defect of fruit shedding. Height of plant, habit and type of inflorescence also vary in forms of different geographical origin. The highest essential oil content is found in forms from Asia Minor, Asiatic Russia and Western Europe, in which the percentage varies from 0·8 to 1·11, and the highest proportion of linalool is found in the forms from Asia Minor.

BOOK REVIEWS

BATEN, W. D. 519.24

Elementary mathematical statistics.

John Wiley and Sons, Inc., New York 1938 : 15s. 0d. Pp. x + 338. figs. + tables. (Chapman and Hall, Ltd., London).

Of four works on statistics recently reviewed, this is the only one which is called "mathematical," but as it is stated in the preface that the book was written primarily for students who have not studied differential and integral calculus, while the first three pages are taken up with the description of the summation symbol, it will be realised that no elementary student need fear to tackle the work. While general in scope, applications to business and economic statistics are being borne in mind. The ubiquitous field experiment, however, finds a place in a brief treatment of analysis of variance. It might have been more instructive to depart from the traditional lines of the biological textbook, and choose an example of a different kind to illustrate this general method.

Otherwise the book follows the traditional line of texts of this character, except that the modern tendency to include tests of significance for small samples is in evidence, although the chapter on standard errors of certain statistics is a little mixed, and is not complete. The correct test for a correlation coefficient is given near the end, yet in Table 15.1 its standard error is wrongly given. The book is curious in that, while in places the discussion is often tediously elementary and repetitive, in other places the algebra is quite heavy. There are cases where this is unnecessary in an elementary text, as in the case of the derivation of the standard error of the mean for a finite parent population, and also cases where the treatment is definitely wrong, as in the formulae for the standard errors of a product and quotient. The third term in (15.7) should be $2AB_{AB}\,\sigma_A\,\sigma_B$, while the same term, with negative sign, should be added to the numerator of (15.8). Useful tables are provided, although it should be pointed out that Tables I and II could have been cut down to half their present size by omitting negative values of t, while 10 pages of squares and square roots, and 18 pages of ordinary logarithms, are somewhat of a luxury in view of the fact that the student is likely to have standard tables of these functions already available. J. W.

PATERSON, D. D. 519.24

Statistical technique in agricultural research. A simple exposition of practice and procedure in biometry.

McGraw-Hill Publishing Company, Ltd., London 1939 : 18s. 0d. Pp. ix + 263. 94 tables + figs.

Described as "a simple exposition of practice and procedure in biometry," this book is well-written, and is designed to present the agricultural research worker with a manual of method in statistics, with special reference to methods of field experimentation. The preliminary treatment is brief, but is written in clear and simple language, and the author is somewhat original in compressing the study of frequency distributions, questions of statistical significance and the study of small samples, into a first chapter of only 30 pages. The reader is then taken straight into analysis of variance and its application to field experiments. Following this are chapters on goodness of fit, diagrams, correlation and regression. The order of subject matter is not the traditional one, nor is it in all respects the logical order, but most of the methods required by the student are presented. The last three chapters are devoted specifically to the subject of field experiments, and form a useful working manual of method, including as they do serial and perennial crop experiments, and recent developments in the way of complex designs. The usual standard tables are included at the end, together with a table of natural logarithms.

The limitations and exact implications of certain formulae are not always precisely stated. Thus, on p. 14 the formula for the standard error of a difference applies only to independent samples; on p. 19 the procedure would not be as indicated if the sample numbers were not equal; on p. 42 the correlation between treatment mean and general mean has not been taken into account; on p. 44 the correspondence of z and t is true in theory as well as practice, since $z = \log_e t$; the arithmetical treatment on pp. 51–2 can be simplified; the Poisson

distribution might with advantage have been treated on p. 88; Figs. 5A and 5B would have been better expressed in histogram form, since the variable is continuous; on p. 109 it is misleading to call $\sqrt{\{(1 - r^2)/(n - 2)\}}$ the standard error of r; and on p. 121 the assumption is made that r_{13} and $r_{13 \cdot 2}$ are independent. But these are minor criticisms, and do not detract materially from the value of the book as a useful and informative work. J. W.

RIDER, P. R. 519.24
An introduction to modern statistical methods.
John Wiley and Sons, Inc., New York 1939 : 13s. 6d. Pp. ix + 220. 17 figs. + tables. (Chapman and Hall, Ltd., London).

This book is written by a mathematician, but is nevertheless an elementary treatise in which for the most part the results only of mathematical processes are cited. To a reader who has some acquaintance with mathematical symbolism the book should be easy reading, and the author is gifted with a lucid style and a power of compression that make one marvel at what he has been able to include in a comparatively short work. The recent disturbance of the traditional order of treatment of the subject matter of statistics is more manifest than ever here, for regression and correlation are taken at a very early stage (p. 27), before the binomial and normal distributions, and before the chapter on what is called "Student's distribution", in which are grouped all the customary tests of significance. The succeeding chapters deal with the χ^2-distribution, analysis of variance and experimental design. The chapter on analysis of variance is rather formidably mathematical in appearance, but numerical examples are provided. The last chapter is interestingly treated, and the author is to be commended for the exceedingly clear way in which he has expounded the principles of orthogonality, and made the question of confounding appear almost easy to understand. This chapter can only, however, be considered as an introduction to methods of experimentation based on factorial design, for a complete exposition of which other writers will have to be consulted. The necessary numerical tables are provided.

A slip in arithmetic on p. 80 has led to a wrong conclusion being reached, and an error in the statement of the degrees of freedom on p. 157 will necessitate consequential alterations in what follows. Each chapter concludes with a number of exercises. J. W.

GOULDEN, C. H. 519.24:631.421
Methods of statistical analysis.
John Wiley and Sons, Inc., New York 1939 : 17s. 6d. Pp. vii + 277. 15 figs. 96 tables. (Chapman and Hall, Ltd., London).

Believing that there are an increasing number of students who have had some elementary training in statistics and some experience in research work, but who require a practical knowledge of methods of analysis and some facility in the devices of calculation, the author has produced for them a carefully-written and well-documented manual which should go far to satisfy the needs of agronomists and plant breeders, among others. He has solved the difficulty of an opening chapter by dealing at once with the logic of statistical methods, and by introducing the idea of the set-up of an experiment before he discusses the methods to be used in analysing the resulting data. The treatment of frequency distributions is on standard lines, but an interesting feature is the early place given to tests of significance with small samples and the design of simple experiments. The treatment of regression and correlation is good, and is taken before tests of goodness of fit. The way is then clear to deal with analysis of variance, after which a long chapter deals with the field plot test, which carries the student up to the most complicated recent examples of factorial and other designs, setting these out in a way that is easy to follow, and making the book an invaluable reference work in this connexion, especially as it is profusely illustrated by means of examples. The analysis of variance is applied to linear regression formulae; the chapter on non-linear regression has a useful comprehensive treatment of the fitting of orthogonal polynomials; and the final chapters deal with analysis of covariance and miscellaneous applications.

In addition to the worked examples, exercises are provided at the end of each chapter. It is evident that the author knows his subject matter well, and there are few points of criticism. A large number of references to other textbooks and to original papers are incorporated, and

the book can be whole-heartedly recommended as a self-contained manual of instruction to students, who need not take too seriously the implication that they should know something of statistics before commencing the study of this book. J. W.

KUCKUCK, H. 575:633
Pflanzenzüchtung. (**Plant breeding**).
Sammlung Göschen Band 1134. Walter de Gruyter and Co., Berlin 1939: RM. 1.62. Pp. 125. 12 illus. 4 tables.

This little book gives a clearly written account of the main principles and methods of plant breeding, and would form a useful basis for any introductory course in the subject conducted in the German language. Successive sections deal with vegetatively propagated, self-fertilized and cross-fertilized plants, the latter group being further subdivided. Within each section the method adopted is to describe the breeding of specific crops as examples, e.g. potatoes and fruit trees are chosen in the first section and barley, lettuce and tomatoes in the second. The treatment is by no means exhaustive and would chiefly be of use to the elementary student. The experimental layouts adopted for variety testing, for instance, do little more than indicate the general principles involved; they would rarely be chosen by the practical experimentalist of to-day.

Little space is devoted to the genetical bases of plant breeding, genetical theory being dealt with in another book of the same series. There is, however, a short section which deals with the inheritance of sex, self-sterility, inbreeding and heterosis, mutations and polyploidy. There are also short chapters dealing with the relationships of plant pathology and physiology with plant breeding.

ROEMER, T. and
RUDORF, W. (editors). 575:633
Handbuch der Pflanzenzüchtung. (**Manual of plant-breeding**).
Paul Parey, Berlin 1939 : Vol. IV : Lief. 8 : pp. 113–92. 23–37 figs. + tables; Vol. V : Lief. 9 : pp. 1–80. 30 figs. 12 tables. RM. 6.50 each part.

A further issue (Lief. 8: Vol. IV) of this text-book which has now appeared continues the section on the potato. This crop (to which 80 pages are devoted) is fully dealt with from various aspects, including breeding and genetics and recent developments in this field. The relevant bibliography comprises 347 references.

The second portion of the issue deals with the soya bean (*Glycine hispida* Max.) from the standpoints of its systematic classification and relationships, suitable breeding material, pollination problems, variation and inheritance of economic characters, the results so far obtained by genetic analysis and the symbols for the genes identified.

This section of the book is not yet completed.

The second issue (Lief. 9: Vol. V) under review is concerned with pome and stone fruits. As far as one can judge from the available portion of the text presented in Lief. 9 (cf." Plant Breeding Abstracts", Vol. IX, p. 142, 252 and 359), the subject matter could be grouped under the following headings: historical aspect; basis, aims and methods in breeding; cytology; origin of cultivated forms; genetics (including somatic mutations); fertility and sterility.

STURTEVANT, A. H. and
BEADLE, G. W. 575.1
An introduction to genetics.
W. B. Saunders Company, Philadelphia and London 1939 : 14s. 0d. Pp. 391. 126 figs.

However many text-books may appear on a given subject, there is always room for another good one and a work by two such distinguished geneticists as Professors Sturtevant and Beadle cannot be regarded as superfluous, in spite of the fact that several genetical text-books designed to serve a similar purpose have already been published. Indeed, the present book gives such a clear, accurate and comprehensive picture of "pure" genetics that it will rank among the very best and should become a standard work.

The authors regard genetics as a "mathematically formulated subject that is logically complete and self-contained" and their account is given in the form of a "logical development in which each step depends on the preceding ones". Starting with sex chromosomes and sex linkage, they proceed to describe autosomal inheritance, independent assortment, linkage, chromosome maps and the relation of crossing-over to meiosis. Intra-chromosomal rearrangements are next considered, then lethals, translocations, multiple alleles and mutations. A rather mixed chapter under the heading "Position Effect" follows and the succeeding chapters deal with non-disjunction and related phenomena, the determination and differentiation of sex, overlapping phenotypes, selection and hybrid vigour, heterogeneous populations, polyploidy, species differences, extrachromosomal inheritance and maternal influences, genes and phenotypes and finally a brief historical chapter. An appendix on probability and an index end the book. General references are given at the end of each chapter and also lists of problems designed to make the student familiar with genetical lines of enquiry. The material used is largely *Drosophila* and maize, though other organisms are used to illustrate specific points. The *Drosophila* system of notation is used almost throughout. Considerable space is devoted to cytological aberrations and their genetic results, the one-to-one relation between chiasmata and cross-overs being used to relate them.

In considering the merit of the book we must bear in mind the needs of the reader. For the student who wants an account of genetics as a pure science this is an outstanding book; the authors' method of attack has been particularly successful in the first part of the book and the force with which the theoretical conclusions are driven home will make this a truly inspiring work for teachers to use. It is, of course, especially suitable for a course accompanied by practical work with *Drosophila*. To those however who are concerned with genetics as a means to an end, e.g. the plant breeder, the book has its limitations, imposed by the outlook of the authors. Their adoption of the logical in place of the historical development means that the applications of the subject are ignored and we find, for example, in the chapter dealing with selection that mass selection is the only type considered. Since modern plant breeding and genetics are founded on and connected by the progeny test this surely indicates a very fundamental limitation, which it seems to the reviewer is precisely due to the abandonment of the historical approach.

In conclusion, one or two minor criticisms may be made. The lack of pairing in haploids and the sterile hybrids which give rise to allopolyploids seems to be overstressed for the effect of chiasma pairing here on the fertility and breeding behaviour of forms produced by gametic chromosome doubling is of considerable practical importance. The definition of secondary polyploidy given on p. 310 has no relation to that in general use at least on this side of the Atlantic. In the appendix an account of the χ^2 test might usefully have been given.

J. L. F.

Küster, E. 576.37
Über Plasmapfropfungen. (**Protoplasmic transplantations**).
Gustav Fischer, Jena 1939 : RM. 5. Pp. ix + 80. 25 figs.

The author follows Giard in dividing the phenomenon of protoplasmic fusion into autoplastic (where different parts of the same cell are concerned), homoplastic (different cells of the same species) and heteroplastic (cells of different species), the three types being dealt with separately in separate chapters. The phenomena associated with the union of protoplasmic masses are described, largely by reference to the literature, though the author's own experiments are also described. The text is illustrated by original figures and reproductions of many other authors' diagrams and photographs. Cases both of normal and of pathological fusion are described, both animal and plant material being included.

Bower, F. O. 58
Botany of the living plant.
MacMillan and Co., Ltd., London, 1939: 3rd Ed. 25s. Pp. xii + 700.
504 figs.

The appearance of a third edition of this well-known text-book of general botany, at an interval of sixteen years from the publication of the second edition, will be generally welcomed

by botanists. The general form of the earlier editions has been retained, but the text has been extensively revised and brought up to date, for which work the author has had the assistance of younger men actually engaged in teaching, notably Professor J. M. F. Drummond and Dr G. Bond. There are a few additions to the book. Short appendices on the botany of the Psilophytales and Equisetales are now included and there is also a new chapter on "The relation of size and form in plants".
This book can be recommended to the botanical student as one of the best general text-books available.

Loomis, W. E. and
Shull, C. A. 581.1:578.08
Experiments in plant physiology. A laboratory textbook.
McGraw-Hill Publishing Company, Ltd., London 1939 : 12s. 0d. Pp. xiv + 213. 52 figs.

The book under review is a revision of Part I of the same authors' "Methods in Plant Physiology" (cf. "Plant Breeding Abstracts", Vol. VII, p. 343), that is, the part dealing with laboratory exercises. Some of the experiments have been simplified, more advanced work has been omitted and some new experiments on hormone action have been added. The aim has been to produce a laboratory text-book for elementary and intermediate courses in plant physiology. J. L. F.

Saunders, E. R. 581.46
Floral morphology. A new outlook with special reference to the interpretation of the gynaeceum.
W. Heffer and Sons, Ltd., Cambridge, 1937: Vol. I. 3s. 6d. Pp. viii + 132. 5 figs; 1939: Vol. II: 10s. 6d. Pp. xiv + 133–609 + vii. 48 figs.

The author of these two volumes was led to a study of carpel structure by the occurrence of plants with abnormal ovaries in cultures of *Matthiola* grown for genetical study. She has now for many years been the leading exponent of the theory of carpel polymorphism, which, it is claimed, solves many of the difficulties in the morphological interpretation of floral structure. Syncarpous and pseudo-apocarpous ovaries are considered to consist of two types of carpels, sterile and fertile, which constitute two alternating whorls. This theory forms the basis of the present volumes. In the first, published two years ago, selected types from 39 families of flowering plants are described. The second volume, recently published, is much larger and in it types from a further 150 families are considered in greater or less detail. The student of morphology will welcome the synthesis of Miss Saunders' many published papers on floral morphology into book form and will find the book useful and stimulating. Some of Miss Saunders' interpretations may prove in course of time to be wrong, but she will nevertheless have performed a most useful service in doing away with much of the dogma which holds up progress in morphological studies and in encouraging a new and more careful approach to the study of the structure of the flower.
One word of criticism that may be added is that one would have liked to have seen many more line drawings and diagrams than are actually given; they would have helped the reader considerably in following the descriptions.

Hueck, K. 581.9(43)
Pflanzengeographie Deutschlands. (**Phytogeography of Germany**).
Hugo Bermühler, Berlin-Lichterfelde 1935 : Published in 20 monthly parts at RM. 2.20 each : Complete, unbound RM. 44 : bound RM. 50.

These 10 parts (11–20) conclude the survey of German plant geography, parts 1–10 of which have already been briefly reviewed in "Plant Breeding Abstracts", Vol. VI, p. 330 and 453. After dividing the country into three main parts, North, South and Central Germany, further sub-divisions are made according to the type of vegetation of the district. The nature of district and the soil conditions are described, followed by a discussion of the relation between the vegetation and the climate. Finally, details are given of the vegetation itself accompanied

by coloured maps showing the distribution of the flora and by excellent photographs of the types of vegetation.
Numerous other maps and diagrams are also provided. This work further enhances the author's reputation and is a valuable contribution to the study of plant geography.

LAWRENCE, W. J. C. and
NEWELL, J. 631.53
Seed and potting composts, with special reference to soil sterilization.
George Allen and Unwin, Ltd., London 1939 : 3s. 6d. Pp. 128. 20 figs.
The raising of seedlings is an important part of breeding and genetical work with plants and workers in these fields will welcome this little book, embodying the results of experiments at the John Innes Horticultural Institution on seed and potting composts. The aim of the book is to replace the complexity practised by most gardeners by a safe simplicity. In place of the numerous composts recommended for different plants the authors recommend only two, a seed compost and a potting compost. The function of the different components in these is explained and illustrated from experimental results. The purpose and methods of soil sterilization are clearly and fully described and there are chapters on feeding pot plants and on glass-house hygiene. An extensive list of some of the plants which have been successfully grown in John Innes composts is given and the book concludes with some useful data and an index. J. L. F.

MEDSGER, O. P. 633(73)
Edible wild plants.
The MacMillan Company, London and New York, 1939 : $3.50. Pp. xv + 323. 99 illus.
Every American nature lover will find this book fascinating and full of surprises. In it descriptions are given of more than 150 edible plants of the United States, and many more are briefly mentioned. In each case details are given of the way in which the plant is prepared for use and interesting historical notes are often added. Many of the plants are illustrated by line drawings. A series of "finding indexes" at the end of the book summarizes the information given and forms a useful aid to the identification of edible plants from any of four sub-divisions of the States.
This book may well form a basis for interesting speculations by the plant breeder. Our range of cultivated crop plants is very limited. How many of these wild plants may some day be scientifically improved and cultivated? Some of them are already important crop plants and others are now being experimented with; for instance, one reads that the dandelion is now cultivated in New Jersey as a salad plant and that several horticultural varieties which form large leafy plants have been developed. Probably many more wild plants will some day be regarded as valuable crops, and the range of material dealt with by the plant breeder will be materially widened.

633.11:575(73)
Report of the sixth hard spring wheat conference.
Minneapolis, Minnesota, February 2 and 3, 1939 : Pp. 71. 17 tables. (Mimeographed).
Among the articles in this report, the following may be cited as being of particular interest to the plant breeder: L. R. Waldron gives examples of transgressive segregations for certain characters, particularly yield, that were observed in the course of wheat breeding experiments in North Dakota. Particular attention is paid to some of a series of selections from a compound cross involving the parents Ceres, Hope, Kota, Florence and 14.3.68, some of which considerably outyield all the parent lines. Selection Ns 2809 shows a marked transgressive segregation for protein content.
S. P. Swenson, in discussing breeding work in South Dakota, states that selections are being made from the cross Hope-Reliance x Reward. Three tested in 1938 were similar to Thatcher in yielding ability but much better in bushel weight. Tests are being made of the leaf rust

and bunt reaction of the selections from this cross. Some selections from the cross Rival x Reward show very good resistance to both stem and leaf rust. Selections from Rival x Thatcher are also being made. The Argentine variety Triumphal has proved interesting in that it is rather resistant to grasshopper attack and yielded well in 1936 under conditions of extreme heat and drought. The F_3 of a cross of Triumphal x Thatcher will be grown in 1939.
E. R. Ausemus deals with breeding work in Minnesota and lists the reactions to stem rust of some of the varieties grown under artificial epidermic conditions. The reactions of the newer varieties to a large number of physiological races of rust show that very considerable progress has been made in breeding for resistance.
Two methods of wheat breeding are used in the state—"recombination" breeding and the back-cross method. Hybrid selections of H 44 crossed with certain double cross strains, particularly Thatcher, are in various stages of testing and some of them are very promising with regard to both yield and rust resistance. The aims are to combine resistance to bunt and to stem and leaf rust with high yield and good quality. Using the back-cross plan, the combination Hope x Thatcher has been used with Thatcher as the recurring parent. The progeny from each back-cross was allowed to self and rust-resistant selections were made and crossed back to Thatcher. Resistant strains with a much higher yield than Thatcher were tested in 1938.
With regard to *Triticum durum*, stem rust resistant lines from Mindum x Pentad have been crossed with Mindum to combine the quality of the latter with the resistance of the former. A number of resistant lines have been isolated, two of them with the desirable grain colour of Mindum. Their quality has not yet been tested.
Current breeding work in the United States on hard red spring wheats is dealt with by J. A. Clark. It is now possible to grow three generations per year in the early stages of breeding by sowing in the greenhouse early in September and again in January, with another crop in the open in the summer. Testing for bunt resistance is accomplished by dusting seed to be grown in the greenhouse with spores and germinating it under optimum conditions for bunt development. Testing for rust is accomplished on the crop sown in the field.
In the later stages of breeding two generations per year can be grown, one in Arizona and a second in North Dakota or Montana.
Results from the milling and baking laboratory are utilized not only in the final selection of new strains but also as a guide to the parents that should be used in further crosses. New high quality strains are immediately crossed with strains showing desirable agronomic qualities. A list is given of some of the most promising hybrid progenies that are being selected and tested.
It has been shown that when certain very rust-resistant wheats such as Mercury are used in crosses, they do not give any completely rust-free lines in F_3, but must be selected to the F_5 or even later to obtain the desired character in a homozygous condition.
G. S. Smith reviews ten years' progress in breeding *T. durum*. Efforts are being made to combine the good macaroni quality of Mindum with stem rust resistance and a stronger straw. Owing to the complex, multi-factorial genetic basis of the quality of Mindum, the back-crossing method has been used with Mindum as the recurring parent. Crosses with Pentad, Iumillo and Monad did not give the required results, since their rust resistance was also complex genetically. The rust resistance of Vernal emmer, however, was of simple inheritance and although the first Mindum x Vernal crosses were of poor quality, some of the later back-cross selections approximate to the desired type. Some of the hybrid strains are also superior in strength of straw. The fourth and fifth back-crosses to Mindum have now been made.

SCHULERUD, A. 633.14:664.641.016
Das Roggenmehl. (**Rye flour**).
Moritz Schäfer, Leipzig 1939 : Pp. viii + 149. 48 figs.
The aim of the author of this work, who has had many years' experience as director of a laboratory of a large concern engaged in the manufacture of bread and working in co-operation with a large milling firm, has been to co-ordinate the numerous problems and research on the production of rye bread.

The various processes involved in making rye bread are reviewed, beginning with the flour and passing then through all stages of the baking process to the finished loaf. The milling process itself has not been dealt with in detail.
Chapter I (pp. 1–7) deals generally with varieties of rye, world production, milling and the mixture of rye and wheat flours.
Chapter II (pp. 8–35) deals with the chemistry of rye flour and chapter III (pp. 36–73) with the structure and physical properties of the various types of dough.
Chapter IV (pp. 73–100) is concerned with effects of various substances, treatments (including storage temperature, heating and the admixture of wheat flour) upon the quality of the rye flour.
Bacterial action and yeast fermentation are considered in chapter V (pp. 101–15), and the baking processes in chapter VI (pp. 115–47).
In addition to the large amount of data presented the work contains valuable critical discussions of the results obtained by various workers and by the author himself, as well as practical suggestions for improvements in the various processes incidental to rye bread manufacture.
A bibliography containing 61 references listed by author and journal is given.

HACKBARTH, J. and
HUSFELD, B. 633.367:581.192.6
Die Süsslupine. Züchtung, Anbau und Verwertung einer neuen Kulturpflanze. (**The sweet lupin. Breeding, cultivation and utilization of a new crop plant**).
Paul Parey, Berlin 1939 : RM. 2.60. Pp. 89. 11 figs. 18 tables.

The story of the production of the so-called "sweet lupins" free from alkaloid in the seed and leaf, which is now fairly generally familiar, is told again in this small handbook. The new crop is regarded as a most valuable source of proteins; the seeds, which in the yellow sweet lupin contain 40 per cent of digestible protein and in the blue 30 per cent, can be used as food for stock; the protein is said moreover to be of a very high biological value so that the lupin follows closely on the soya bean as a source of food proteins. Varietal differences have been observed in the biological value and in the content of digestible protein. No deleterious effects from the sweet lupins have been observed and several generations of experimental animals such as rats have been fed on them without damage to their health. For some animals the seeds must be shelled, for others, such as sheep, they can be fed whole.
The main value of the sweet lupins is however the production of green fodder of exceptionally high protein content.
In addition to this and to a number of other uses, it has been found that a flour approaching soya bean flour in properties can be produced from sweet lupins and has been used successfully for human consumption. The great advantage of this is that the lupins can be cultivated in zones and on soils quite unsuited to soya bean cultivation. The high digestibility and quality of the proteins, as in the soya bean, make them highly suitable for replacing animal proteins.
The area of cultivation of sweet lupins in Germany has increased from 2 hectares in 1931 to over 100,000 in 1938. The methods of cultivation are described, emphasis being laid on the necessity for soil inoculation before introducing them into new areas.

BUKASOV, S. M. and
ŠARINA, N. E. 633.491:576.16
(**History of the potato**).
Sel'khozgiz, Moscow 1938 : 1 rouble 70 kopeks. Pp. 102. 37 figs.

A full description is given of native potato cultivation in the Andes and in Chile and Chiloe; the independence of the two groups is argued on linguistic and other grounds. The discovery of the potato by the *conquistadores* is described, and the view expressed that if Drake obtained the potato it must have been on his voyage to the West Indies and Cartagena, most probably from a Spanish ship that had brought it by sea from Peru or Chile. The possibilities of this occurring are held to be extremely remote and it is thought more probable that the potato was first brought to Spain from Chile, tubers of the October–November harvest being likely

to arrive in good condition for planting in the succeeding spring. Drake, it is stated, most probably obtained the potato from Clusius, as did Gerarde at a later date. A second, independent introduction into England is dismissed as improbable, and the possibility that the original introduction was from Peru is similarly dismissed on the score that the Andean forms are short-day reactors and would not have survived in northern Europe.*

The penetration of the potato into other countries and the development of its cultivation are traced, and an outline is given of early attempts at potato breeding and of the results of the Soviet Expeditions to S. America, with descriptions and illustrations of the many new species discovered and indications of their breeding value. The first few varieties possessed of desirable economic characters combined with blight resistance or frost resistance have now been produced and many more promising seedlings are under observation.

HARLAND, S. C. 633.51:575.1

The genetics of cotton.

Jonathan Cape, London 1939 : 10s. 6d. Pp. 193. figs. + tables.

It was only in 1924 that the number of chromosomes in certain species of the genus *Gossypium* was determined by Denham yet, in the intervening period, an amount of knowledge concerning the genetics of this genus and the chromosomal associations has accumulated which ranks it with *Drosophila, Zea, Antirrhinum* and *Nicotiana* as a mine of information on the *modus operandi* of inheritance. In some respects the genus *Gossypium* possesses a superiority over the others for this purpose; it falls into two distinct groups according to the number of chromosomes, a diploid group (2n = 26) and a tetraploid group (2n = 52), and each of these groups includes several good species; specific differences range over a large number of characters; interspecific sterility is never complete and cytological abnormalities are absent. Foremost among the students of this genus is the author who has brought together in the volume under review the result of his own investigations and those of others.

The tenor of the book may best be summarized by outlining briefly the general conclusions he draws on the broad issue of the mode of inheritance of characters. The 11 species, including the two Asiatic cultivated species, forming the diploid group may be divided into sub-groups showing greater or less interspecific sterility between their respective members, while the 6 species, including the 3 New World cultivated species, forming the tetraploid group are all mutually crossable with relative freedom from sterility. Cytological studies suggest that the tetraploid group arose by crossing between two members of the diploid group one of which was the parent of the Asiatic cultivated cottons and the other a parental form of the present New World wild species. The genetical constitution of those wild species which are found scattered through the Pacific Islands (the tetraploids *G. tomentosum, G. Taitense* and *G. Darwinii* and the diploid *G. Klotzschianum*), and in Australia, the diploid *G. Sturtii*, further suggests the origin of these allopolyploids as dating before the break up of the southern land mass.

Since the origin of these groups, geographical isolation combined with mutation has led to considerable changes in the genetical architecture of the various species of both groups. The changes which are indicated may be summarized as follows:—

(1) Changes in the genes themselves leading to the formation of multiple allele series the characters of which show simple Mendelian inheritance on a specific modifier complex.

(2) Changes in the modifier complex leading, with the same gene, to blending inheritance.

The point, as well as the practical method of approach, is well illustrated by the character of anthocyanin colour, which forms in its varied expressions homologous series both in the diploid and tetraploid groups. In the tetraploids, anthocyanin formation and distribution are controlled by at least 5 multiple alleles plus two different genes (R_H giving red plant body in *G. hirsutum* and R_D giving red leaf veins and stem in *G. Darwinii*), and in the diploids by 6 multiple alleles. Further, through the successful introduction of fertility into the cross *G. arboreum* (diploid) x *G. barbadense* (tetraploid) by repeated back-crossing on to *G. hirsutum*, the author succeeded in transferring the gene for red plant body of the Asiatic (diploid) multiple allele series on to a *G. hirsutum* complex and in proving it to be a member of the New

*Experiments at Cambridge have shown that many of the Andean potatoes are actually long-day forms. Ed.

World (tetraploid) multiple allele series but showing a much weakened phenotypic expression on the *G. hirsutum* background.

The body of the book summarizes the information available on the 61 characters which have so far been investigated. Mainly through the application by the author of the methods illustrated above, there is built up a taxonomic classification which is given in the first chapter and which, in its broad basis, is unlikely to be altered; though details, particularly with regard to the less known species and certain wild species, remain to be adjusted. The available information on linkage and mutation within the genus is presented and an admittedly speculative outline of its evolutionary history rounds off the book which forms not merely a valuable account of the genetics of the genus *Gossypium* but has a direct bearing on theories of evolutionary change. H. M. L.

ADRIAENS, L. 633.93:581.192

Contribution à l'étude chimique de quelques gommes du Congo Belge. (**Contribution to the chemical study of some gums of the Belgian Congo**).

M. Hayez, Bruxelles 1939 : Fr. 22. Pp. 100. 9 figs. 4 tables. [Mém. Inst. Roy. Colon. Belge (Sect. Sci. Nat. Méd.) Tome VIII].

This book contains chemical analyses of the gums of six plants which grow in the Belgian Congo; *Acacia Farnesiana*, *A. Sieberiana*, *Albizzia gummifera*, *Cedrela odorata*, *Grevillea robusta*, and a tree known to the natives as "lagi". There are also brief discussions of the phenomena of gum exudation in plants and some general considerations of the chemical and physical properties of gums and mucilages.

PEDERSEN, A. 634.11(48.9)

Danmarks Frugtsorter. I. Aebler. (**Danish fruit varieties. I. Apples**).

Gartnerforenings Bogforlag, København Hefte 3. Pp. 129–92. illus.

Part 3 of Vol. I of this useful and well produced series has now appeared (cf. "Plant Breeding Abstracts", Vol. IX, p. 149). Sixteen more varieties of apples grown in Denmark are described and illustrated as before.

NEW JOURNALS

Scientia Genetica.

A new quarterly genetical journal has appeared on the occasion of the 210th anniversary of the birth of Lazzaro Spallanzani. It is intended primarily for the publication of original researches on inheritance and variability of both plants and animals made in the Latin countries. Work by authors of other nationalities will also be published but the papers must be written in Italian, French, Spanish or Portuguese.

Each paper will be provided with a short summary in Latin, German and English. Papers will be accepted on branches of science other than genetics in its narrowest sense, such as cytology, embryology, systematics, biometrics and physiology when the results have an important bearing on the solution of genetical problems.

Vol. I, No. 1 contains an article on "Effects of heat on microsporogenesis in *Secale cereale*" (cf. Abst. 1649) which will be of interest to plant breeders.

(Published by Rosenberg and Sellier, Via Andrea Doria, N.14, Torino (III), Italy. Price: Italy and the Italian Empire 150 Lire per volume, other countries 175 Lire, post free, single numbers 50 Lire.)

Imperial Forestry Bureau.

The journal "Forestry Abstracts" presents abstracts, in English, of the current world literature of all branches of forestry, reviews of papers on forestry problems of general interest and importance, and book reviews. It is published quarterly, four numbers making a volume. The annual subscription is 20s. for residents of the countries of the British Commonwealth and Anglo-Egyptian Sudan who send their subscriptions direct to the Bureau, 25s. for all other subscribers, and 7s. 6d. for single parts. Subscriptions or exchanges should be sent to the Deputy Director, Imperial Forestry Bureau, 39, Museum Road, Oxford, England.

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